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IDENTIFICATION

PRODUCT CODE:	MAINDEC-11-DZLSA-A-D
PRODUCT NAME:	LS11 CENTRONICS PRINTER TEST
DATE CREATED:	NOVEMBER 1972
MAINTAINER:	DIAGNOSTIC GROUP
AUTHOR:	B. BURGESS

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1. ABSTRACT

This program is designed to test and exercise Centronics printers.
The basic logic tests executed and exercises performed are as follows:

(a) manual intervention (optional) to check hardware alarms. For further details see TEST 0 under PROGRAM DESCRIPTION.
(b) status and buffer register addressability
(c) done bit = clear and set; as well as mode & IE bits after RESET
(d) interrupt enable bit = clear and set
(e) interrupts with processor at levels 4 thru 7
(f) interrupt with processor at level 3
(g) deselect interrupt
(h) format control characters
(I) bell
(J) relative timing technique for checking time to execute a certain line length (4 lengths in this program) and slewing rate.
(see Section 8.4 to interpret relative time test results)
(k) data transfer lines
(l) character generation
(m) lower case letters forced to UPPER CASE
(n) Switch register input (optional) to print lines of characters regular or elongated. For further details see TEST 31 under PROGRAM DESCRIPTION.
(o) print time free pulse generator (optional). For further details see TEST 31 under PROGRAM DESCRIPTION.

2. REQUIREMENTS

2.1 Equipment

PDP-11 standard computer with console teletype. A Centronics printer and LS11 interface.

2.2 Storage

This program requires a minimum of 4k storage.

2.3 Preliminary Programs

None

3. LOADING PROCEDURE

Use standard procedure for loading .ABS tapes.

4. STARTING PROCEDURE

4.1 Control Switch Settings

See 5.1 (all down for worst case testing).

4.2 Starting Address

The program is started at 200. It may be restarted at 600 after appropriate switch settings (if any) have been selected.

4.3 Program & Operator Action

1. Load program into memory using .ABS loader.

   NOTE: The user should now specify the number of columns desired in "COLCNT" in the variable section at the front of the program. The number should be specified in OCTAL, THE LIMITS BEING 80 TO 132 DECIMAL columns.

2. Load address 200.
3. Set switches (see Section 5.1), all down for worst case.
4. Press start.
5. Hit continue switch if TTY requests it.
6. The program will loop & TTY bell will ring once every pass.
   Replace the contents of location 'RING' in the variable section at the front of the program with some 'character' code if your TTY doesn't echo the bell.

   NOTE: Manual intervention testing is not required for device testing but can be accessed for checking hardware alarms with BIT08 set to a 1 on a LOAD ADDRESS = 200, or by selecting TEST 0 with BIT09 set to a 1 on LOAD ADDRESS =600.

5. OPERATING PROCEDURE

5.1 Operational Switch Settings

Start address = 200 with all switches down is worse case testing. The bell will ring upon completion of a pass of the entire program. (see Item 6 under paragraph 4,3 above)

The switch settings are:

```
SW<15>=1...,HALT ON ERROR
SW<14>=1...,SCOPE LOOP
SW<13>=1...,INHIBIT ERROR PRINTOUT
SW<12>  ...,SELECT  "PRINT  TIME  FREE"  PULSE
    GENERATOR
              SEE PROGRAM DESCRIPTION OF TEST 31
SW<11>  ...,NOT USED
SW<10>=1...,ELONGATION ON SWR INPUT TEST
              SEE PROGRAM DESCRIPTION OF TEST 31
SW< 9>=1...,SELECTION OF A PARTICULAR TEST
SW< 8>=1...,SELECT MANUAL INTERVENTION
SW<7thru0>...,CONTAINS THE TEST NO. * USED WITH
                SW<9>
```

5,2 Subroutine Abstracts

5,2,1 SCOPE

This subroutine call (via a TRAP instruction) is placed between each test in the instruction section. It records the starting address of each test in location "RETURN" as it is being entered. If a SCOPE loop is requested, SW<14>=1, the current test will be looped upon until HALTED by the user. The contents of "RETURN" may be used to determine the last test successfully completed.

5,2,2 HLT

This routine call (via an EMT instruction) prints out the program counter (PC) and an error message (see Section 6,1). If SW<15>=1 and a HLT is executed, the program will HALT with the PC & error message printed out. If SW<15>=0 and a HLT is executed, the PC & error message are printed out and the program will continue in execution. To inhibit error printout put SW<13> on a 1.

5,2,3 Trapcatcher

A ",+2" - "HALT" sequence is repeated from loc. 0 to loc. 776 to catch any unexpected traps. Thus, any unexpected traps will HALT at the device trap vector +2.

5,3 Program and Operator Action

The following user requests are made by the program during the optional MANUAL INTERVENTION section of the program:

1. SELECT PRINTER ON LINE, HIT CONTINUE SWITCH TO RESUME OPERATION,

2. OPEN FRONT PANEL & HIT TOP OF FORM = PAPER SHOULD NOT ADVANCE,
   HIT CONTINUE SWITCH TO RESUME OPERATION,

3. REMOVE PAPER,
   HIT CONTINUE SWITCH TO RESUME OPERATION,

4. PUT PAPER BACK, HIT CONTINUE SWITCH TO RESUME OPERATION,

6, ERRORS

6,1 Error Printout

The format is as follows:

PC="XXXXX" ERROR MESSAGE

where,

XXXXX=octal value of program counter location at time of error

ERROR MESSAGE = one of the following:

a. Error bit set
b. Error bit not set
c. Done bit not set
d. Done bit not clear
e. Printer interrupted when processor above level 3
f. Printer didn't interrupt when processor at level 3
g. Done bit never cleared
h. Select code not recognized
i. Deselect code not recognized - If Model doesn't have feature - OK
j. Address failure - 'ADDERR' contains PC of error
k. IE bit not set
l. IE bit not clear
m. IE bit set - shouldn't be
n. Mode bit (BIT0) set - shouldn't be

o, Printer didn't interrupt on deselect feature
p, Done bit never cleared
q, Printer interrupted with processor below printer level & IE bit clear

To find the failing test, look at the listing above the address typed. From this it should become apparent as to what was being done before the error occurred.

6,2 Error Recovery

Restart at 600

6,3 Error Counter

Not used

7, RESTRICTIONS

The program has the capability of variable column width by changing location 'COLCNT' in the variable section at the front of the program. The program is currently set for 132 (DECIMAL) cols. Be aware that the program will only handle 80 to 132 (DECIMAL) cols. properly.

8, MISCELLANEOUS

8,1 Execution Time

Worse case (all switches down) approximately 11 min. for full 132 col. testing.

8,2 Stack Pointer

Stack is initially set to 1100.

8,3 Pass Count

A program pass thru count is kept in "PCNT".

8,4 Average Relative Time Table

TEST NO.	MACHINE					
	15/20	05/10	/40	/45 CORE	/45 MOS	/45 BIP
14	33	29	60	47	88	132
15	26	23	47	37	70	104
16	22	19	40	31	60	88

17	15	13	27	21	40	60
20	9	8	17	13	19	36

NOTE: The numbers above can vary + or - 20%

8,5 Iterations

As mentioned in the NOTE below (under TEST NO, 5) the basic logic tests are automatically done 200 times each. If desirable the no. of iterations can be changed by changing "ICNT" & "REICNT" in the variable section at the front of the program. If an error occurs while iterating, iterations on that particular test stops, and the program proceeds to the next test.

9, PROGRAM DESCRIPTION

TEST NO,	FUNCTION
0	Manual intervention test Checks the error bit & select and deselect codes. See Section 5,3 for operator action. This test is not performed on worse case testing (all switches down). It is accessed, however, with BIT08 set to a 1 with a LOAD ADDRESS of 200. It can also be accessed by selecting TEST 0 in conjunction with BIT09 set to a 1 with a LOAD ADDRESS of 600.
1	Centronics address test Checks the addressability of the used status and data buffer register addresses. NOTE: The address of the falling address is kept in 'ADDERR'.
2	Done, mode & IE bit test Checks the done bit for clear & set capability, as well as checking that RESET doesn't set the mode or IE bits.
3	Interrupt enable bit test Checks the IE bit for clear and set capability.
4	Interrupt level test - processor above level 3

Checks that the printer which is at a priority level of 4 will not interrupt when the processor is at a priority level of 4 thru 7,
NOTE: 'LSINT' contains printer interrupt vector of 200 & a printer priority level of 4 is in 'INTLVL',

5 Interrupt level test - processor at level 3
Checks that the printer which is at a priority level of 4 will interrupt when the processor is at a priority level of 3,
NOTE: 'LSINT' contains printer interrupt vector of 200 & a printer priority level of 4 is in 'INTLVL',

NOTE: (a) Tests 1 thru 5 will automatically be done 200 times each under program control, However, if an error occurs iterations will stop & testing will proceed,
(b) Tests 6 thru 27 are done 1 time unless BIT14 is set for looping on the test,

6 Deselect interrupt test
Checks that the printer will interrupt even though it has been deselected,

7 Carriage return test
Checks that carriage return functions properly, 'CR' is printed out,

10 Line feed test
Checks that line feed functions properly, 'LF' is printed out, On worse case testing it should appear directly under 'CR',

11 Delete test
Checks that delete functions properly, 'DEL' is printed out, On worse case testing it should appear directly under 'LF',

12 Vertical tab test
Checks that vertical tab functions properly, 3 'VT's are printed out,

On worse case testing it should appear a number of lines after 'DEL' dependent on the paper tape currently in the printer.

13 Form feed test
Checks that form feed functions properly, 2 'FF's are printed out, If paper has been positioned properly 'FF' will appear at the top of page.

14 Bell test
Checks that the bell functions properly, 'BELL' is printed out, On worse case testing it should appear directly under 'FF'. An audible sound is heard.

15 132 chars./line relative timing test
Checks relative time to execute 132 chars./line printout. The printout is 1 full line of characters followed by RELATIVE TIMING=n where n=a decimal number which will be dependent on the machine the printer is interfaced to.

NOTE! If less than 132 cols. is specified in 'COLCNT' this test is not done. Only the 'TEST NO.' will appear!

16 100 chars./line relative timing test
Checks relative time to execute 100 chars./line printout. The printout is 1 line of 100 chars. followed by RELATIVE TIMING=n where n=a decimal number which will be dependent on the machine the printer is interfaced to.

NOTE! If less than 100 cols. is specified in 'COLCNT' this test is not done. Only the 'TEST NO.' will appear!

17 80 chars./line relative timing test
Checks relative time to execute 80 chars./line printout. The printout

is 1 line of 80 chars, followed by RELATIVE TIMING=n where n=a decimal number which will be dependent on the machine the printer is interfaced to,

20 40 chars./line relative timing test
Checks relative time to execute 40 chars./line printout. The printout is 1 line of 40 chars, followed by RELATIVE TIMING=n where n=a decimal number which will be dependent on the machine the printer is interfaced to,

21 Slew rate relative timing test
Checks relative time to execute 2 line feeds, 2 line feeds are executed followed by RELATIVE TIMING=n where n=a decimal number which will be dependent on the machine the printer is interfaced to,

22 Data transfer lines test
Checks that the data transfers lines function properly. Printout is 2 lines of alternating @'s and ?'s
!,e,@?@?@?,...,
?@?@?@,...,

23 Left-handed wedge with overprint
Checks spacing, overprint, carriage return, & line feed rigorously. Printout is a left-handed wedge consisting of lines of E's overprinted 1 time with a '/' appearing in the last column position of each line.
!,e. EEE,.../
EEE,../
EEE,,/
:
:
:

24 Regular block pattern with overprint (64 chars,)
Checks character generation of regular size chars. Printout is a block pattern of each of 64 chars,

from a 'space' to '~', Each line of each character is overprinted 1 time,
i.e.,

```
      1st line = spaces
!!!!!!! ,,,,
""""""" ,,,,
####### ,,,,
   .
   .
   .
   .
```

25 Elongated block pattern with overprint (64 chars,)
Checks character generation of elongated size chars, Printout is a block pattern of each of 64 chars, from a 'space' to '~', Each line of each character is overprinted 1 time, The pattern is the same as shown above except elongated,

26 Regular counter clockwise rotating pattern
Checks character generation of regular size chars, from a worse case standpoint, Printout is a counterclockwise rotating block pattern of each of 64 chars, from 'space' to '~',
i.e.,

```
    !"#$%&'()*+,-./
  - !"#$%&'()*+,-.
 +- !"#$%&'()*+,-
 ]+- !"#$%&'()*+,
   .
   .
   .
   .
```

27 Elongated counter clockwise rotating pattern
Checks character generation of elongated size chars, from a worse case standpoint, Printout is a counterclockwise rotating block pattern of each of 64 chars, from 'space' to '~', The pattern is same as shown above except elongated,

30 Lower case alphabet test
Checks that codes for lower case

letters are forced to upper case codes for printout. Two lines are printed out, thusly

A B C D E F ,...,
A B C D E F ,...

The 1st line produced by upper case codes & the 2nd line produced by lower case codes. Both lines should be UPPER CASE!

31 This test is a combination of 2 routines! (a) Switch register input test (optional).
This test can only be accessed by selecting TEST 31 in conjunction with BIT09 set to a 1. BIT10 set to a 1 indicates elongation. Full lines of the char. selected are printed out. If a 'DESELECT' code is accidentally given, the test will wait for a 'SELECT' code to be given before proceeding.
NOTE! A DESELECT code is 23 (octal) & a SELECT code is 21 (octal).

(b) Print time free pulse generator (optional).
This test can only be accessed by selecting TEST 31 in conjunction with BIT09 set to a 1. BIT12 must also be set to a 1. If there is a problem with a particular character all you need to do is to access this test for scoping. Once you think the problem is corrected all you have to do is to throw BIT12 down (set to 0) to see it printed out. With BIT12 down you are in the other optional routine of TEST 31. In essence, you can alternate back & forth.

```
1
2                                       .TITLE  MAINDEC-11-DZLSA-A
3                                   ;COPYRIGHT 1972, DIGITAL EQUIPMENT CORP., MAYNARD, MASS.
4                                   ;PROGRAM BY BRUCE BURGESS
5                                   ;
6                                   ;
```

```
                                        ;
                                        ;
          000200                                ,=200
000200    000167  001074                       JMP     BEGIN           ;JMP TO INITIAL START OF PROGRAM
          000600                                ,=600
000600    005067  000450                       CLR     PCNT            ;CLEAR PROGRAM PASS COUNT
000604    000167  001024                       JMP     RSTART          ;GO TO RESTART OF PROGRAM
          000020                                ,=20                    ;IOT TRAP VECTOR
000020    006144                                TYP                     ;START LOCATION OF IOT HANDLER
000022    000340                                340                     ;NEW PROCESSOR LEVEL OF 7
          000030                                ,=30                    ;EMT TRAP VECTOR
000030    006412                                ERROR                   ;START LOC. OF EMT HANDLER
000032    000340                                340                     ;NEW PROCESSOR LEVEL OF 7
000034    006254                                SCOPEC                  ;START LOCATION OF SCOPE HANDLER
000036    000000                                0                       ;NEW PROCESSOR LEVEL
                                        ;
                                        ;
          001200                                ,=1200
                                        ;*****************************************************************
                                        ;
                                        ;HARDWARE REGISTERS
                                        ;
                                        ;*****************************************************************
001200    177514                LSCS:   177514                  ;CENTRONICS STATUS REGISTER ADDRESS
001202    177516                LSDB:   177516                  ;CENTRONICS DATA BUFFER ADDRESS
001204    177776                PSW:    177776                  ;PROCESSOR STATUS REGISTER ADDRESS
001206    177566                TPB:    177566                  ;TELETYPE DATA BUFFER ADDRESS
001210    177564                TPS:    177564                  ;TELETYPE STATUS REGISTER ADDRESS
001212    000200                LSINT:  200                     ;CENTRONICS PRINTER INTERRUPT VECTOR
001214    000202                LSPR:   202                     ;CONTAINS PSW FOR PRINTER INTERRUPTS
001216    000200                INTLVL: 200                     ;CONTAINS PRINTER INTERRUPT LEVEL
                                                                ;IN THIS INSTANCE, 200 = LEVEL 4
                                        ;*****************************************************************
                                        ;
                                        ;PROGRAM COUNTERS AND VARIABLES
                                        ;
                                        ;*****************************************************************
001220    000000                LFNO:   0                       ;NO. OF LINE FEEDS ISSUED
001222    000000                CHARS:  0                       ;NO. OF PRINTABLE CHARS. ON A LINE
001224    000000                CHRGEN: 0                       ;CHARACTER TO BE LOADED INTO BUFFER
001226    000000                CNTR:   0                       ;LINE REPEAT COUNTER
001230    000000                TIMER:  0                       ;RELATIVE TIME COUNT HOLDER
001232    000000                WAREA:  0                       ;DECODING WORK AREA
001234    000000                WORK:   0                       ;CHARS./LINE HOLDER
001236    000000                TYPDAT: 0                       ;CHARACTER TO BE OUTPUTTED ON TELETYPE
001240    000000                CYCLE:  0                       ;1000 TIME LOOP COUNTER FOR RELATIVE TIME
001242    000000                ELONG:  0                       ;DETERMINES REGULAR OR ELONGATED CHARS.
001244    000000                SAVESP: 0                       ;NO. OF SPACES=NO. OF E'S IN WEDGE
001246    000000                LINCNT: 0                       ;LINE COUNTER
001250    000000                CHARNO: 0                       ;NO. OF AVAILABLE CHARS. AT A TIME
                                                                ;IN ROTATING PATTERNS
001252    000000                TEST:   0                       ;CHARS./LINE TIME TEST INDICATOR
001254    000000                PCNT:   0                       ;PROGRAM PASS COUNT HOLDER
001256    000310                ICNT:   310                     ;WORKING AREA FOR ITERATION COUNT (200 DECIMAL)
```

```
                                RECNT: 310                      ;USED FOR RESTORING OF ICNT
                                ICOUNT: 0                       ;ICOUNT=0 INDICATES DON'T ITERATE
                                                                ;USED FOR MANUAL INTERVENTION TEST
                                ERRIND: 0                       ;SCOPE INDICATOR TO STOP ITERATIONS
                                                                ;BECAUSE AN ERROR HAS OCCURRED
                                                                ;ERRIND=1 SET IN ERROR ROUTINE
                                DELAY: 0                        ;VARIABLE DELAY FOR WAITING ON PRINTER FLAGS
                                ADDERR: 0                       ;CONTAINS PC OF ADDRESS FAILURE
                                SAVEPC: 0                       ;CONTAINS PC TO BE DECODED ON
                                                                ;ERROR PRINTOUTS
                                COLCNT: 204                     ;COLUMN WIDTH DESIRED FOR TESTING (OCTAL VALUE)
                                RING: 7                 ;TELETYPE BELL CODE
                                ;*****************************************************************
                                ;
                                ;EQUIVALENCES
                                ;
                                ;*****************************************************************
                                        NOP=240                 ;USED FOR ACT-11 OVERLAY
                                        TYPE=IOT                ;TTY MESSAGE PRINTOUT CALL
                                        HLT=EMT                 ;TTY ERROR MESSAGE PRINTOUT CALL
                                        SCOPE=TRAP              ;LOOP ON TEST CALL
                                        SWR=177570              ;ADDRESS OF CONSOLE SWITCH REGISTER
                                        BUSERR=4                ;BUS ERROR TIME OUT VECTOR
                                        R0=%0                   ;
                                        R1=%1                   ;
                                        R2=%2                   ;
                                        R3=%3                   ;GENERAL PURPOSE
                                        R4=%4                   ;REGISTERS
                                        R5=%5                   ;
                                        R6=%6                   ;
                                        R7=%7                   ;
                                ;*****************************************************************
                                ;
                                ;MACRO DEFINITION FOR PRINTING OUT TEST NOS. ON CENTRONICS PRINTER
                                ;
                                ;*****************************************************************
                                        .MACRO  TYPTST V,W
                                'V:     .ASCIZ  /W/             ;TEST NO. TO BE PRINTED OUT
                                        MOV     #'V,R1          ;MOVE ADDRESS OF TEST NO. PRINTOUT TO R1
                                        JSR     R7,TSTTAG       ;GO TO PRINT OUT TEST NO.
                                        .ENDM
                                ;*****************************************************************
                                ;
                                ;MACRO DEFINITIONS FOR PICKING UP THE TEST TO BE PERFORMED
                                ;FROM THE CONTENTS OF THE SWITCH REGISTER
                                ;
                                ;*****************************************************************
                                        .MACRO  TESTNO Y
                                        TST'Y
                                        .ENDM
                                ;
                                ;
                                        .MACRO  UPDATE
                                        .NLIST                  ;DON'T LIST NEXT LINE DURING MACRO EXPANSION
```

```
                                        X=X+1
                                        .LIST                   ;BEGIN LISTING AGAIN
                                        .ENDM   UPDATE
                                ;*****************************************************************
                                ;
                                ;MACRO DEFINITION FOR PICKING UP ERROR MESSAGES
                                ;
                                ;*****************************************************************************
                                        .MACRO  MESSNO Z
                                        EMSG'Z
                                        .ENDM
                                ;*****************************************************************
                                ;
                                ;THIS MARKS THE BEGINNING OF THE PRINTER DIAGNOSTIC
                                ;ROUTINE (OPTIONAL) TO PERFORM BASIC MANUAL INTERVENTION TESTS.
                                ;IF BIT08 ISN'T SET AND ALL SWITCHES ARE DOWN THE PROGRAM WILL
                                ;START AT TEST #1 ON A PASS THRU PROGRAM BASIS.
                                ;
                                ;*****************************************************************
001300  005067  177750         BEGIN:  CLR     PCNT            ;CLEAR PASS COUNT INDICATOR
001304  012706  001100                 MOV     #1100,R6        ;SET UP STACK POINTER
001310  112777  000021  177664         MOVB    #21,@LSDB       ;SELECT PRINTER ON LINE IN CASE IT
                                                                ;IS INITIALLY DESELECTED
001316  005067  177744                 CLR     DELAY           ;WAIT FOR EXECUTION
001322  004467  004560                 JSR     R4,WAITON
001326  000005                         RESET                   ;INITIALIZE
001330  036727  176234  000400         BIT     SWR,#400        ;DO WE WANT MANUAL INTERVENTION TESTS?
001336  001536                         BEQ     RSTART          ;NO!
001340  012767  001346  005030         MOV     #TST0,RETURN    ;YES!
001346  005067  177710         TST0:   CLR     ICOUNT          ;ICOUNT=0 INDICATING DON'T ITERATE
001352  005067  177706                 CLR     ERRIND          ;RESET ERROR INDICATOR
001356  000004                         TYPE                    ;PRINT OUT
001360  006752                         MES2                    ;"SELECT PRINTER ON LINE"
001362  000004                         TYPE                    ;PRINT OUT "HIT CONTINUE SWITCH
001364  007002                         MES3                    ;TO RESUME OPERATION"
001366  000000                         HALT                    ;WAIT FOR CONTINUE SWITCH
001370  112777  000023  177604         MOVB    #23,@LSDB       ;ISSUE A DESELECT CODE
001376  005777  177576                 TST     @LSCS           ;IS ERROR BIT SET?
001402  100402                         BMI     SEL1            ;YES - SHOULD BE
001404  104007                         HLT     +7              ;NO
001406  104400                         SCOPE
001410  012767  017777  177616 SEL1:  MOV     #17777,WORK     ;GIVE PLENTY OF TIME
001416  005367  177612                 DEC     WORK            ;FOR LIGHT TO
001422  001375                         BNE     .-4             ;TURN OFF
001424  112777  000021  177550         MOVB    #21,@LSDB       ;ISSUE A SELECT CODE
001432  005067  177630                 CLR     DELAY           ;SELECT CODE NEEDS A MIN. OF 3 MSEC TO SET
001436  004467  004444                 JSR     R4,WAITON       ;WAIT FOR LOADING
001442  005777  177532                 TST     @LSCS           ;IS ERROR BIT SET?
001446  100002                         BPL     DESEL1          ;NO - SHOULDN'T BE
001450  104006                         HLT     +6              ;YES
001452  104400                         SCOPE
001454  112777  000023  177520 DESEL1: MOVB    #23,@LSDB       ;ISSUE A DESELECT CODE
001462  005777  177512                 TST     @LSCS           ;IS ERROR BIT SET?
001466  100402                         BMI     SEL2            ;YES - IT SHOULD BE
```

```
169  001470  104007                          HLT     +7.             ;NO
170  001472  104400                          SCOPE
171  001474  012767  017777  177532  SEL2:   MOV     #17777,WORK     ;GIVE PLENTY OF TIME
172  001502  005367  177526                  DEC     WORK            ;FOR LIGHT TO
173  001506  001375                          BNE     .-4             ;TURN OFF
174  001510  000004                          TYPE                    ;PRINT OUT "OPEN FRONT PANEL & HIT TOP
175  001512  007052                          MES4                    ;OF FORM - PAPER SHOULDN'T ADVANCE"
176  001514  000004                          TYPE                    ;PRINT OUT "HIT CONTINUE SWITCH TO
177  001516  007002                          MES3                    ;RESUME OPERATION"
178  001520  000000                          HALT                    ;WAIT FOR CONTINUE SWITCH
179  001522  112777  000021  177452          MOVB    #21,@LSDB       ;ISSUE A SELECT CODE
180  001530  005067  177532                  CLR     DELAY           ;SELECT CODE NEEDS A MIN. OF 3 MSEC TO SET
181  001534  004467  004346                  JSR     R4,WAITON       ;WAIT FOR LOADING
182  001540  005777  177434                  TST     @LSCS           ;IS ERROR BIT CLEAR?
183  001544  100002                          BPL     SEL3            ;YES - IT SHOULD BE
184  001546  104006                          HLT     +6              ;NO
185  001550  104400                          SCOPE
186  001552  000004                  SEL3:   TYPE                    ;PRINT OUT "REMOVE PAPER"
187  001554  007150                          MES5
188  001556  000004                          TYPE                    ;PRINT OUT "HIT CONTINUE SWITCH TO
189  001560  007002                          MES3                    ;RESUME OPERATION"
190  001562  000000                          HALT
191  001564  005777  177410                  TST     @LSCS           ;IS ERROR BIT SET?
192  001570  100402                          BMI     SEL4            ;YES - IT SHOULD BE
193  001572  104010                          HLT     +10             ;NO
194  001574  104400                          SCOPE
195  001576  000004                  SEL4:   TYPE                    ;PRINT OUT "PUT PAPER BACK"
196  001600  007166                          MES6
197  001602  000004                          TYPE                    ;PRINT OUT "HIT CONTINUE SWITCH TO
198  001604  007002                          MES3                    ;RESUME OPERATION"
199  001606  000000                          HALT                    ;WAIT FOR CONTINUE SWITCH
200  001610  005777  177364                  TST     @LSCS           ;IS ERROR BIT CLEAR?
201  001614  100002                          BPL     SEL5            ;YES - IT SHOULD BE
202  001616  104000                          HLT     +0              ;NO
203  001620  104400                          SCOPE
204  001622  105777  177352          SEL5:   TSTB    @LSCS           ;IS DONE BIT SET?
205  001626  100402                          BMI     RSTART          ;YES
206  001630  104001                          HLT     +1              ;NO
207                                  ;*****************************************************************
208                                  ;
209                                  ;THIS ROUTINE WILL SELECT AND START AT A PARTICULAR TEST,
210                                  ;IF BIT09 IS NOT INITIALLY SET IN THE SWITCH REGISTER
211                                  ;A PASS THRU THE PROGRAM FROM THE BEGINNING IS ASSUMED,
212                                  ;
213                                  ;*****************************************************************
214  001632  104400                  RSTART: SCOPE
215  001634  012706  001100                  MOV     #1100,R6        ;INITIALIZE STACK POINTER
216  001640  000004                          TYPE                    ;PRINT OUT
217  001642  006730                          MES1                    ;"MAINDEC-11-DZLSAA"
218  001644  062767  000001  177410          ADD     #1,ICOUNT       ;ICOUNT=1 INDICATING ITERATIONS
219  001652  005067  177406                  CLR     ERRIND          ;RESET ERROR INDICATOR
220  001656  036727  175706  001000          BIT     SWR,#1000       ;DO WE WANT A PARTICULAR TEST?
221  001664  001405                          BEQ     TST1            ;NO - START FROM TEST #1
222  001666  116701  175676                  MOVB    SWR,R1          ;MOVE THE TEST NO. TO REGISTER 1
```

```
  223  001672  006301                          ASL     R1              ;SHIFT TEST NO, TO GET PROPER WORD COUNT
  224  001674  000171  014270                  JMP     @TABLE(R1)      ;JUMP TO SELECTED TEST
  225                                ;*****************************************************************
  226                                ;
  227                                ;SECTION TO TEST THAT THE PRINTER IS ACTUALLY IN THE SYSTEM
  228                                ;AND RESPONDS TO ADDRESSING
  229                                ;
  230                                ;*****************************************************************
  231  001700  012767  001700  004470 TST1:   MOV     #TST1,RETURN    ;INITIALIZE BEGINNING SCOPE LOOP
  232  001706  012767  001732  176070         MOV     #ERRA,BUSERR    ;ERROR JUMP FOR BUS TIME OUT ERROR
  233  001714  010700                         MOV     R7,R0           ;PC TO 'ADDERR' FROM R0
  234  001716  005077  177256                 CLR     @LSCS           ;ADDRESS USED ADDRESS 177514
  235  001722  010700                         MOV     R7,R0           ;PC TO 'ADDERR' FROM R0
  236  001724  005277  177252                 INC     @LSDB           ;ADDRESS USED ADDRESS 177516
  237  001730  000403                         BR      .+10            ;ADDRESSES OK! - PROCEED
  238  001732  104011                 ERRA:   HLT     +11             ;ERROR - DIDN'T RESPOND TO ADDRESSING
  239  001734  022626                         CMP     (R6)+,(R6)+     ;RESTORE THE STACK TO 1100
  240  001736  000760                         BR      TST1            ;FAILURE! - DON'T PROCEED WITH TESTING
  241  001740  012767  000006  176036         MOV     #6,BUSERR       ;RESTORE TRAPCATCHER
  242  001746  005067  176034                 CLR     6
  243  001752  000404                         BR      SC0
  244                                ;*****************************************************************
  245                                ;
  246                                ;SECTION TO TEST THAT THE DONE BIT
  247                                ;FUNCTIONS PROPERLY
  248                                ;ALSO THAT THE INTERRUPT ENABLE BIT & MODE BIT
  249                                ;NEVER SET ON A RESET INSTRUCTION
  250                                ;
  251                                ;*****************************************************************
  252  001754  012767  001766  004414 TST2:   MOV     #RDY0,RETURN    ;SET RETURN ADDRESS FOR SCOPE
  253  001762  000401                         BR      RDY0            ;IF SELECTING THIS TEST
  254  001764  104400                 SC0:    SCOPE                   ;LOOP ON ADDRESS TEST?
  255  001766  000005                 RDY0:   RESET                   ;CLEAR THE WORLD
  256  001770  005777  177204                 TST     @LSCS           ;IS ERROR BIT SET?
  257  001774  100002                         BPL     RDY1            ;NO
  258  001776  104000                         HLT     +0              ;YES
  259                                ;
  260                                ;
  261  002000  104400                         SCOPE
  262  002002  105777  177172         RDY1:   TSTB    @LSCS           ;IS DONE BIT SET?
  263  002006  100402                         BMI     ERRIT2          ;YES
  264  002010  104001                         HLT     +1              ;NO
  265  002012  104400                         SCOPE
  266
  267
  268                                ;
  269                                ;
  270  002014  032777  000100  177156 ERBIT2: BIT     #100,@LSCS      ;IS IE BIT (BIT06) SET?
  271  002022  001402                         BEQ     RDY2            ;NO
  272  002024  104014                         HLT     +14             ;YES
  273                                ;
  274                                ;
  275  002026  104400                         SCOPE
  276  002030  032777  000001  177142 RD92:   BIT     #1,@LSCS        ;IS MODE BIT (BIT0) SET?
```

```
  277  002036  001402                          BEQ     RDY3            ;NO
  278  002040  104015                          HLT     +15             ;YES
  279                                  ;
  280                                  ;
  281  002042  104400                          SCOPE
  282  002044  112777  000101  177130  RDY3:   MOVB    #101,@LSDB      ;LOAD BUFFER WITH AN 'A'
  283  002052  012767  177754  177206          MOV     #-20.,DELAY     ;SET A DELAY FOR DONE FLAG BACK UP
  284  002060  004467  004022                  JSR     R4,WAITON       ;WAIT FOR DONE FLAG
  285  002064  105777  177110                  TSTB    @LSCS           ;IS DONE BIT SET?
  286  002070  100402                          BMI     RDY4            ;YES
  287  002072  104005                          HLT     +5              ;NO - IT NEVER SET!
  288                                  ;
  289                                  ;
  290  002074  104400                          SCOPE
  291  002076  112777  000177  177076  RDY4:   MOVB    #177,@LSDB      ;LOAD BUFFER WITH 'DELETE' CHAR,
  292  002104  005067  177156                  CLR     DELAY           ;DELETE CODE NEEDS A LONG TIME TO CLEAR  BUFFER
  293  002110  004467  003772                  JSR     R4,WAITON       ;WAIT FOR DONE FLAG
  294  002114  105777  177060                  TSTB    @LSCS           ;IS DONE BIT SET?
  295  002120  100406                          BMI     SC00            ;YES
  296  002122  104005                          HLT     +5              ;NO - IT NEVER SET
  297  002124  000404                          BR      SC00
  298                                  ;*****************************************************************
  299                                  ;
  300                                  ;SECTION TO TEST THAT THE INTERRUPT ENABLE
  301                                  ;BIT CAN BE SET AND CLEARED
  302                                  ;
  303                                  ;*****************************************************************
  304  002126  012767  002140  004242  TST3:   MOV     #IEBIT,RETURN   ;SET RETURN ADDRESS FOR SCOPE
  305  002134  000401                          BR      IEBIT           ;IF SELECTING THIS TEST
  306  002136  104400                  SC00:   SCOPE                   ;LOOP ON IE BIT TEST?
  307  002140  012777  000340  177036  IEBIT:  MOV     #340,@PSW       ;SET PROCESSOR STATUS AT LEVEL 7
  308  002146  052777  000100  177024          BIS     #100,@LSCS      ;SET IE BIT
  309  002154  032777  000100  177016          BIT     #100,@LSCS      ;IS IE BIT SET?
  310  002162  001002                          BNE     .+6             ;YES
  311  002164  104012                          HLT     +12             ;NO
  312                                  ;
  313                                  ;
  314  002166  104400                          SCOPE
  315  002170  042777  000100  177002          BIC     #100,@LSCS      ;CLEAR IE BIT
  316  002176  032777  000100  176774          BIT     #100,@LSCS      ;IS IE BIT CLEAR?
  317  002204  001403                          BEQ     .+10            ;YES
  318  002206  104013                          HLT     +13             ;NO
  319                                  ;
  320                                  ;
  321  002210  104400                          SCOPE
  322  002212  000411                          BR      IEBIT1          ;IE BIT NOT CLEAR - SEE IF RESET CLEARS IT
  323  002214  052777  000100  176756          BIS     #100,@LSCS      ;SET IE BIT AGAIN
  324  002222  032777  000100  176750          BIT     #100,@LSCS      ;IS IE BIT SET?
  325  002230  001002                          BNE     .+6             ;YES
  326  002232  104012                          HLT     +12             ;NO
  327                                  ;
  328                                  ;
  329  002234  104400                          SCOPE
  330  002236  000005                  IEBIT1: RESET                   ;CLEAR THE IE BIT!
```

```
  331  002240  032777  000100  176732          BIT     #100,@LSCS      ;IS IE BIT CLEAR?
  332  002246  001406                          BEQ     SC1             ;YES
  333  002250  104013                          HLT     +13             ;NO
  334  002252  000404                          BR      SC1
  335                                  ;*****************************************************************
  336                                  ;
  337                                  ;SECTION TO TEST THAT THE PRINTER WHICH HAS A NORMAL PRIORITY LEVEL OF 4
  338                                  ;WILL NOT INTERRUPT TILL THE PROCESSOR IS AT A PRIORITY LEVEL OF 3
  339                                  ;ALSO, THAT IT WILL NOT INTERRUPT EVEN IF THE PROCESSOR IS AT LEVEL 3
  340                                  ;AS LONG AS THE INTERRUPT ENABLE BIT IS NOT SET!
  341                                  ;
  342                                  ;*****************************************************************
  343  002254  012767  002266  004114  TST14:  MOV     #IENAB,RETURN   ;SET RETURN ADDRESS FOR SCOPE
  344  002262  000401                          BR      IENAB           ;IF SELECTING THIS TEST
  345  002264  104400                  SC1:    SCOPE                   ;LOOP ON DONE BIT CHECK?
  346  002266  000005                  IENAB:  RESET                   ;CLEAR THE WORLD
  347  002270  012777  002534  176714          MOV     #INTVEC,@LSINT  ;NEW 'PC' IF INTERRUPT OCCURS
  348  002276  012777  000340  176710          MOV     #340,@LSPR      ;NEW 'PS' IF INTERRUPT OCCURS
  349  002304  005777  176670                  TST     @LSCS           ;IS ERROR BIT SET?
  350  002310  100002                          BPL     IENAB1          ;NO
  351  002312  104000                          HLT     +0              ;YES
  352                                  ;
  353
  354
  355                                  ;
  356                                  ;
  357  002314  104400                          SCOPE
  358  002316  105777  176656          IENAB1: TSTB    @LSCS           ;IS DONE BIT SET?
  359  002322  100402                          BMI     IENAB2          ;YES
  360  002324  104001                          HLT     +1              ;NO
  361                                  ;
  362                                  ;
  363  002326  104400                          SCOPE
  364  002330  012777  000340  176646  IENAB2: MOV     #340,@PSW       ;SET PROCESSOR AT LEVEL 7
  365  002336  004467  000140                  JSR     R4,IECHK        ;CHECK FOR INTERRUPT
  366  002342  104400                          SCOPE
  367  002344  012777  000300  176632          MOV     #300,@PSW       ;SET PROCESSOR AT LEVEL 6
  368  002352  127767  176626  176636          CMPB    @PSW,INTLVL     ;ARE WE ABOVE PRINTER INTERRUPT LEVEL??
  369  002360  002426                          BLT     IENOGO          ;NO - JUMP TO TEST WITH IE BIT NOT SET
  370  002362  004467  000114                  JSR     R4,IECHK        ;CHECK FOR INTERRUPT
  371  002366  104400                          SCOPE
  372  002370  012777  000240  176606          MOV     #240,@PSW       ;SET PROCESSOR AT LEVEL 5
  373  002376  127767  176602  176612          CMPB    @PSW,INTLVL     ;ARE WE ABOVE PRINTER INTERRUPT LEVEL??
  374  002404  002414                          BLT     IENOGO          ;NO - JUMP TO TEST WITH IE BIT NOT SET
  375  002406  004467  000070                  JSR     R4,IECHK        ;CHECK FOR INTERRUPT
  376  002412  104400                          SCOPE
  377  002414  012777  000200  176562          MOV     #200,@PSW       ;SET PROCESSOR AT LEVEL 4
  378  002422  127767  176556  176566          CMPB    @PSW,INTLVL     ;ARE WE ABOVE PRINTER INTERRUPT LEVEL??
  379  002430  002402                          BLT     IENOGO          ;NO - JUMP TO TEST WITH IE BIT NOT SET
  380  002432  004467  000044                  JSR     R4,IECHK        ;CHECK FOR INTERRUPT
  381                                  ;
  382                                  ;
  383  002436  104400                  IENOGO: SCOPE
  384  002440  012777  002542  176544          MOV     #INVEC,@LSINT   ;NEW 'PC' IF INTERRUPT OCCURS
```

```
  385  002446  012777  000340  176540          MOV     #340,@LSPR      ;NEW 'PS' IF INTERRUPT OCCURS
  386  002454  012777  000140  176522          MOV     #140,@PSW       ;SET PROCESSOR AT LEVEL 3
  387  002462  012767  000002  176544          MOV     #2,WORK         ;SET UP FOR APPROX', 20 MICROSEC, WAIT
  388  002470  005367  176540                  DEC     WORK            ;TO SEE IF INTERRUPT OCCURS
  389  002474  001375                          BNE     .-4
  390  002476  000167  000064                  JMP     SC2             ;IT DIDN'T! OK BECAUSE IE BIT WASN'T SET
  391                                  ;
  392                                  ;
  393  002502  052777  000100  176470  IECHK:  BIS     #100,@LSCS      ;SET PRINTER IE BIT
  394  002510  012767  000002  176516          MOV     #2,WORK         ;SET UP FOR APPROX', 20 MICROSEC, WAIT
  395  002516  005367  176512                  DEC     WORK            ;TO SEE IF INTERRUPT OCCURS
  396  002522  001375                          BNE     .-4
  397  002524  042777  000100  176446  CLRIE:  BIC     #100,@LSCS      ;NO INTERRUPT-CLEAR IE BIT
  398  002532  000204                          RTS     R4              ;OK! CHECK NEXT PROCESSOR LEVEL
  399                                  ;*****************************************************************
  400                                  ;
  401                                  ;INTERRUPT HANDLER IF PRINTER INTERRUPTS WHILE
  402                                  ;PROCESSOR IS AT PRIORITY LEVEL 4 THRU 7
  403                                  ;
  404                                  ;*****************************************************************
  405  002534  104003                  INTVEC: HLT     +3              ;PRINT ERROR MESSAGE = INTERRUPT OCCURRED!
  406  002536  022626                          CMP     (R6)+,(R6)+     ;POP STACK BACK 2 FROM INTERRUPT
  407  002540  000771                          BR      CLRIE           ;GO BACK TO CLEAR IE BIT
  408                                  ;
  409                                  ;
  410                                  ;*****************************************************************
  411                                  ;
  412                                  ;INTERRUPT HANDLER IF PRINTER INTERRUPTS WHILE PROCESSOR
  413                                  ;IS AT LEVEL 3 BUT THE INTERRUPT ENABLE BIT IS NOT SET
  414                                  ;
  415                                  ;*****************************************************************
  416  002542  104020                  INVEC:  HLT     +20             ;PRINT ERROR MESSAGE = INTERRUPT OCCURRED!
  417  002544  022626                          CMP     (R6)+,(R6)+     ;POP STACK BACK 2 FROM INTERRUPT
  418  002546  012777  000340  176430          MOV     #340,@PSW       ;GIVE PROCESSOR CONTROL AGAIN
  419  002554  000404                          BR      SC2
  420                                  ;
  421                                  ;
  422                                  ;*****************************************************************
  423                                  ;
  424                                  ;SECTION TO TEST THAT THE PRINTER WHICH IS AT A NORMAL PRIORITY LEVEL OF 4
  425                                  ;WILL INDEED INTERRUPT WHEN THE PROCESSOR IS AT A PRIORITY LEVEL OF 3
  426                                  ;
  427                                  ;*****************************************************************
  428  002556  012767  002570  003612  TST5:   MOV     #IENAB3,RETURN  ;SET RETURN ADDRESS FOR SCOPE
  429  002564  000401                          BR      IENAB3          ;IF SELECTING THIS TEST
  430  002566  104400                  SC2:    SCOPE                   ;LOOP ON INTERRUPT NOT OCCURRING
  431  002570  012777  003044  176414  IENAB3: MOV     #INVEC1,@LSINT  ;NEW 'PC' IF INTERRUPT OCCURS
  432  002576  012777  000340  176410          MOV     #340,@LSPR      ;NEW 'PS' IF INTERRUPT OCCURS
  433  002604  005777  176370                  TST     @LSCS           ;IS ERROR BIT SET?
  434  002610  100002                          BPL     IENAB4          ;NO
  435  002612  104000                          HLT     +0              ;YES
  436                                  ;
  437                                  ;
  438  002614  104400                          SCOPE
```

```
 439  002616  012777  000140  176360  IENAB4: MOV     #140,@PSW       ;SET PROCESSOR AT LEVEL 3
 440  002624  052777  000100  176346          BIS     #100,@LSCS      ;SET PRINTER IE BIT
 441                                                                  ;AN INTERRUPT SHOULD OCCUR
 442  002632  012767  000002  176374          MOV     #2,WORK         ;SET UP FOR APPROX', 20 MICROSEC, WAIT
 443  002640  005367  176370                  DEC     WORK            ;TO SEE IF INTERRUPT OCCURS
 444  002644  001375                          BNE     .-4
 445  002646  012777  000340  176330          MOV     #340,@PSW       ;GIVE PROCESSOR CONTROL
 446  002654  042777  000100  176316          BIC     #100,@LSCS      ;CLEAR IE BIT
 447  002662  104004                          HLT     +4              ;NO INTERRUPT OCCURRED! - IT SHOULD HAVE
 448  002664  104400                  IECHK1: SCOPE
 449  002666  000403                          BR      IENAB5          ;GO TO NEXT TEST
 450                                          ;*************************************************************
 451                                          ;
 452                                          ;SECTION TO TEST THE DESELECT INTERRUPT FEATURE
 453                                          ;
 454                                          ;*************************************************************
 455  002670  012767  002676  003500  TST6:   MOV     #IENAB5,RETURN  ;SET RETURN ADDRESS FOR SCOPE
 456  002676  112777  000023  176276  IENAB5: MOVB    #23,@LSDB       ;ISSUE A DESELECT CODE
 457  002704  005777  176270                  TST     @LSCS           ;IS ERROR BIT SET?
 458  002710  100402                          BMI     IENAB6          ;YES - IT SHOULD BE
 459  002712  104007                          HLT     +7              ;NO - IT IS NOT
 460  002714  104400                          SCOPE
 461  002716  012767  017777  176310  IENAB6: MOV     #17777,WORK     ;GIVE PLENTY OF TIME
 462  002724  005367  176304                  DEC     WORK            ;FOR LIGHT TO
 463  002730  001375                          BNE     .-4             ;TURN OFF
 464  002732  012777  003056  176252          MOV     #INVEC2,@LSINT  ;NEW 'PC' IF INTERRUPT OCCURS
 465  002740  012777  000340  176246          MOV     #340,@LSPR      ;NEW 'PS' IF INTERRUPT OCCURS
 466  002746  005077  176232                  CLR     @PSW            ;MAKE PROCESSOR INACTIVE
 467  002752  052777  000100  176220          BIS     #100,@LSCS      ;SET IE BIT
 468  002760  012767  000002  176246          MOV     #2,WORK         ;SET UP FOR APPROX', 20 MICROSEC, WAIT
 469  002766  005367  176242                  DEC     WORK            ;TO SEE IF INTERRUPT OCCURS
 470  002772  001375                          BNE     .-4
 471  002774  012777  000340  176202          MOV     #340,@PSW       ;GIVE PROCESSOR CONTROL
 472  003002  042777  000100  176170          BIC     #100,@LSCS      ;CLEAR IE BIT
 473  003010  104016                          HLT     +16             ;NO INTERRUPT OCCURRED - IT SHOULD HAVE
 474  003012  104400                  IECHK2: SCOPE
 475  003014  112777  000021  176160          MOVB    #21,@LSDB       ;ISSUE A SELECT CODE
 476  003022  005067  176240                  CLR     DELAY           ;SELECT CODE NEEDS A MIN. OF 3 MSEC TO SET
 477  003026  004467  003054                  JSR     R4,WAITON       ;WAIT FOR LOADING
 478  003032  005777  176142                  TST     @LSCS           ;IS ERROR BIT CLEAR?
 479  003036  100020                          BPL     SC3             ;YES
 480  003040  104000                          HLT     +0              ;NO
 481  003042  000416                          BR      SC3
 482                                          ;*************************************************************
 483                                          ;
 484                                          ;INTERRUPT HANDLER IF PRINTER INTERRUPTS AS IT SHOULD
 485                                          ;I.E.-WHEN PROCESSOR IS AT PRIORITY LEVEL 3
 486                                          ;
 487                                          ;*************************************************************
 488  003044  042777  000100  176126  INVEC1: BIC     #100,@LSCS      ;CLEAR IE BIT
 489  003052  022626                          CMP     (R6)+,(R6)+     ;RESET STACK AND RETURN
 490  003054  000703                          BR      IECHK1          ;CHECK INTERRUPT INDICATOR & ACT ACCORDINGLY
 491                                          ;*************************************************************
 492                                          ;
```

```
                                        ;INTERRUPT HANDLER IF PRINTER INTERRUPTS AS IT SHOULD
                                        ;I.E. - PROCESSOR INACTIVE, IE BIT SET, AND PRINTER DESELECTED
                                        ;
                                        ;*************************************************************************
003056  042777  000100  176114  INVEC2: BIC     #100,@LSCS      ;CLEAR IE BIT
003064  022626                          CMP     (R6)+,(R6)+     ;POP STACK BACK 2 FROM INTERRUPT
003066  000751                          BR      IECHK2
                                        ;*************************************************************************
                                        ;
                                        ;SECTION TO TEST THAT THE SPECIAL CHARS, I.E CARRIAGE RETURN,
                                        ;LINE FEED,DELETE,VERTICAL TAB,FORM FEED,AND BELL DO INDEED
                                        ;FUNCTION PROPERLY BEFORE PROCEEDING
                                        ;
                                        ;*************************************************************************
003070  012767  003102  003300  TST7:   MOV     #CARRET,RETURN  ;SET RETURN ADDRESS FOR SCOPE
003076  000401                          BR      CARRET          ;IF SELECTING THIS TEST
003100  104400                  SCS:    SCOPE                   ;LOOP ON INTERRUPT OCCURRED AT WRONG LEVEL?
                                        ;*************************************************************************
                                        ;
                                        ;CARRIAGE RETURN CHECKED NEXT
                                        ;
                                        ;*************************************************************************
003102  112777  000103  176072  CARRET: MOVB    #103,@LSDB      ;MOVE 'CR' INTO
003110  105777  176064                  TSTB    @LSCS
003114  100375                          BPL     .-4
003116  112777  000122  176056          MOVB    #122,@LSDB      ;DATA BUFFER
003124  105777  176050                  TSTB    @LSCS
003130  100375                          BPL     .-4
003132  112777  000015  176042          MOVB    #15,@LSDB       ;AND A CARRIAGE RETURN
003140  105777  176034                  TSTB    @LSCS           ;CHECK FOR DONE BIT CLEAR
003144  100002                          BPL     ERBIT3          ;YES
003146  104002                          HLT     +2              ;NO
                                        ;
003150  104400                          SCOPE
003152  005777  176022          ERBIT3: TST     @LSCS           ;IS ERROR BIT SET?
003156  100002                          BPL     RETCHK          ;NO
003160  104000                          HLT     +0              ;YES
                                        ;
003162  104400                          SCOPE
003164  105777  176010          RETCHK: TSTB    @LSCS           ;IS PRINTER STILL BUSY?
                                        ;
003170  100405                          BMI     SC4             ;NO
003172  000767                          BR      ERBIT3          ;YES - WAIT
                                        ;*************************************************************************
                                        ;
                                        ;LINE FEED CHECKED NEXT
                                        ;
                                        ;*************************************************************************
003174  012767  003206  003174  TST10:  MOV     #LFEED,RETURN   ;SET RETURN ADDRESS FOR SCOPE
003202  000401                          BR      LFEED           ;IF SELECTING THIS TEST
003204  104400                  SC4:    SCOPE                   ;LOOP ON CARRIAGE RETURN CHECK?
003206  112777  000012  175766  LFEED:  MOVB    #12,@LSDB       ;ISSUE A LINE FEED
003214  105777  175760                  TSTB    @LSCS           ;IS DONE BIT CLEAR?
```

```
547  003220  100002                          BPL     ERBIT4          ;YES
548  003222  104002                          HLT     +2              ;NO
549                                  ;
550  003224  104400                          SCOPE
551  003226  005777  175746          ERBIT4: TST     @LSCS           ;ERROR BIT SET?
552  003232  100035                          BPL     LFCHK           ;NO
553  003234  104000                          HLT     +0              ;YES
554  003236  104400                          SCOPE
555  003240  000432                          BR      LFCHK
556  003242  112777  000114  175732  LFEED1: MOVB    #114,@LSDB      ;MOVE 'LF' INTO
557  003250  105777  175724                  TSTB    @LSCS
558  003254  100375                          BPL     .-4
559  003256  112777  000106  175716          MOVB    #106,@LSDB      ;DATA BUFFER AND
560  003264  105777  175710                  TSTB    @LSCS
561  003270  100375                          BPL     .-4
562  003272  112777  000015  175702          MOVB    #15,@LSDB       ;ISSUE A CARRIAGE RETURN
563  003300  105777  175674                  TSTB    @LSCS           ;DONE BIT CLEAR?
564  003304  100002                          BPL     ERBIT5          ;YES
565  003306  104002                          HLT     +2              ;NO
566                                  ;
567  003310  104400                          SCOPE
568  003312  005777  175662          ERBIT5: TST     @LSCS           ;ERROR BIT SET?
569  003316  100007                          BPL     CRCHK           ;NO
570  003320  104000                          HLT     +0              ;YES
571  003322  104400                          SCOPE
572  003324  000404                          BR      CRCHK
573                                  ;
574  003326  105777  175646          LFCHK:  TSTB    @LSCS           ;PRINTER BUSY?
575  003332  100743                          BMI     LFEED1          ;NO
576  003334  000734                          BR      ERBIT4          ;YES = WAIT
577                                  ;
578  003336  105777  175636          CRCHK:  TSTB    @LSCS           ;PRINTER BUSY?
579  003342  100405                          BMI     SC5             ;NO
580  003344  000762                          BR      ERBIT5          ;YES = WAIT
581                                  ;**************************************************************
582                                  ;
583                                  ;DELETE CHECKED NEXT
584                                  ;
585                                  ;**************************************************************
586  003346  012767  003360  003022  TST11:  MOV     #DELETE,RETURN  ;SET RETURN ADDRESS FOR SCOPE
587  003354  000401                          BR      DELETE          ;IF SELECTING THIS TEST
588  003356  104400                  SC5:    SCOPE                   ;LOOP ON LINE FEED CHECK?
589  003360  112777  000012  175614  DELETE: MOVB    #12,@LSDB       ;ISSUE A LINE FEED
590  003366  105777  175606                  TSTB    @LSCS           ;IS DONE BIT CLEAR?
591  003372  100002                          BPL     ERBIT6          ;YES
592  003374  104002                          HLT     +2              ;NO
593
594
595                                  ;
596                                  ;
597  003376  104400                          SCOPE
598  003400  005777  175574          ERBIT6: TST     @LSCS           ;ERROR BIT SET?
599  003404  100027                          BPL     LFCHK1          ;NO
600  003406  104000                          HLT     +0              ;YES
```

```
                                        SCOPE
                                        BR      LFCHK1
                                ;
                                ;
003414  112777  041102  175560  DLETE1: MOVB    #^B'B,@LSDB     ;LOAD BUFFER WITH 'B'
                                                                ;ONLY LOWER BYTE LOADED
003422  105777  175552                  TSTB    @LSCS
003426  100375                          BPL     .-4
003430  112777  000177  175544          MOVB    #177,@LSDB      ;ISSUE A DELETE COMMAND
003436  105777  175536                  TSTB    @LSCS           ;IS DONE BIT CLEAR?
003442  100002                          BPL     ERBIT7          ;YES
003444  104002                          HLT     .+2             ;NO
                                ;
                                ;
003446  104400                          SCOPE
003450  005777  175524          ERBIT7: TST     @LSCS           ;ERROR BIT SET?
003454  100007                          BPL     DELCHK          ;NO
003456  104000                          HLT     .+0             ;YES
003460  104400                          SCOPE
003462  000404                          BR      DELCHK
                                ;
                                ;
003464  105777  175510          LFCHK1: TSTB    @LSCS           ;PRINTER STILL BUSY?
003470  100751                          BMI     DLETE           ;NO
003472  000742                          BR      ERBIT6          ;YES
                                ;
                                ;
003474  105777  175500          DELCHK: TSTB    @LSCS           ;PRINTER BUSY?
003500  100401                          BMI     DLETE1          ;NO
003502  000762                          BR      ERBIT7          ;YES-WAIT
                                ;
                                ;
003504  112777  000104  175470  DLETE1: MOVB    #104,@LSDB      ;LOAD PRINTER DATA
003512  105777  175462                  TSTB    @LSCS
003516  100375                          BPL     .-4
003520  112777  000105  175454          MOVB    #105,@LSDB      ;BUFFER WITH 'DEL'
003526  105777  175446                  TSTB    @LSCS
003532  100375                          BPL     .-4
003534  112777  000114  175440          MOVB    #114,@LSDB      ;DELETE WORKED IF LINE HAS
                                                                ;'DEL' AND NOT 'BDEL'
003542  105777  175432                  TSTB    @LSCS
003546  100375                          BPL     .-4
003550  112777  000015  175424          MOVB    #15,@LSDB       ;ISSUE A CARRIAGE RETURN
003556  105777  175416                  TSTB    @LSCS           ;DONE BIT CLEAR?
003562  100002                          BPL     ERBIT8          ;YES
003564  104002                          HLT     .+2             ;NO
                                ;
                                ;
003566  104400                          SCOPE
003570  005777  175404          ERBIT8: TST     @LSCS           ;ERROR BIT SET?
003574  100002                          BPL     CRCHK1          ;NO
003576  104000                          HLT     .+0             ;YES
```

```
                                        ;
                                        ;
003600  104400                          SCOPE
003602  105777  175372          CRCHK1: TSTB    @LSCS           ;PRINTER BUSY?
003606  100405                          BMI     SC6             ;NO
003610  000767                          BR      ERBIT8          ;YES-WAIT
                                        ;*****************************************************************
                                        ;
                                        ;VERTICAL TAB CHECKED NEXT
                                        ;
                                        ;*****************************************************************
003612  012767  003624  002556  TST12: MOV     #VERTAB,RETURN  ;SET RETURN ADDRESS FOR SCOPE
003620  000401                          BR      VERTAB          ;IF SELECTING THIS TEST
003622  104400          SC6:    SCOPE                           ;LOOP ON DELETE CHECK?
003624  012767  000003  175402  VERTAB: MOV     #3,WORK         ;SET UP FOR 3 VERTICAL TABS
003632  112777  000013  175342  VTAB1:  MOVB    #13,@LSDB       ;ISSUE A VERTICAL TAB
003640  105777  175334                  TSTB    @LSCS           ;DONE BIT CLEAR?
003644  100002                          BPL     ERBIT5          ;YES
003646  104002                          HLT     +2
                                        ;
                                        ;
003650  104400                          SCOPE
003652  005777  175322          ERBIT5: TST     @LSCS           ;ANY ERROR?
003656  100002                          BPL     VTCHK           ;NO
003660  104000                          HLT     +0              ;YES
                                        ;
                                        ;
003662  104400                          SCOPE
003664  105777  175310          VTCHK:  TSTB    @LSCS           ;PRINTER BUSY?
003670  100401                          BMI     VTAB2           ;NO
003672  000767                          BR      ERBIT5          ;YES-WAIT
                                        ;
                                        ;
003674  112777  000126  175300  VTAB2:  MOVB    #126,@LSDB      ;LOAD PRINTER DATA
003702  105777  175272                  TSTB    @LSCS
003706  100375                          BPL     .-4
003710  112777  000124  175264          MOVB    #124,@LSDB      ;BUFFER WITH 'VT'
003716  105777  175256                  TSTB    @LSCS
003722  100375                          BPL     .-4
003724  112777  000015  175250          MOVB    #015,@LSDB      ;AND A CARRIAGE RETURN
003732  105777  175242                  TSTB    @LSCS           ;DONE BIT CLEAR?
003736  100002                          BPL     ERBIT9          ;YES
003740  104002                          HLT     +2              ;NO
                                        ;
                                        ;
003742  104400                          SCOPE
003744  005777  175230          ERBIT9: TST     @LSCS           ;ANY ERROR?
003750  100002                          BPL     CRCHK2          ;NO
003752  104000                          HLT     +0              ;YES
                                        ;
                                        ;
003754  104400                          SCOPE
003756  105777  175216          CRCHK2: TSTB    @LSCS           ;PRINTER BUSY?
```

```
  709  003762  100401                          BMI     MOREVT          ;NO
  710  003764  000767                          BR      ERBIT9          ;YES - WAIT
  711                                  ;
  712                                  ;
  713  003766  005367  175242         MOREVT: DEC     WORK            ;DECREASE # OF VT'S
  714  003772  005767  175236                 TST     WORK            ;HAVE WE DONE 3 VT'S
  715  003776  001315                          BNE     VTAB1           ;NO - GO BACK & DO ANOTHER
  716  004000  000404                          BR      SC7             ;YES - GO ON
  717
  718
  719                                  ;*****************************************************************
  720                                  ;
  721                                  ;FORM FEED CHECKED NEXT
  722                                  ;
  723                                  ;*****************************************************************
  724  004002  012767  004014  002366 TST13:  MOV     #FFEED,RETURN   ;SET RETURN ADDRESS FOR SCOPE
  725  004010  000401                          BR      FFEED           ;IF SELECTING THIS TEST
  726  004012  104400         SC7:    SCOPE                           ;LOOP ON VERTICAL TAB CHECK?
  727  004014  012767  000002  175212 FFEED:  MOV     #2,WORK         ;SET UP FOR 2 FORM FEEDS
  728  004022  112777  000014  175152 FFEED1: MOVB    #14,@LSDB       ;ISSUE A FORM FEED
  729  004030  105777  175144                 TSTB    @LSCS           ;DONE BIT CLEAR?
  730  004034  100002                          BPL     ERR10           ;YES
  731  004036  104002                          HLT     +2              ;NO
  732                                  ;
  733                                  ;
  734  004040  104400                          SCOPE
  735  004042  005777  175132         ERR10:  TST     @LSCS           ;ANY ERROR?
  736  004046  100002                          BPL     FFCHK           ;NO
  737  004050  104000                          HLT     +0              ;YES
  738                                  ;
  739                                  ;
  740  004052  104400                          SCOPE
  741  004054  105777  175120         FFCHK:  TSTB    @LSCS           ;PRINTER BUSY?
  742  004060  100401                          BMI     FFEED2          ;NO
  743  004062  000767                          BR      ERR10           ;YES-WAIT
  744                                  ;
  745                                  ;
  746  004064  112777  000106  175110 FFEED2: MOVB    #'F,@LSDB       ;PUT 'FF' INTO DATA BUFFER
  747  004072  105777  175102                 TSTB    @LSCS
  748  004076  100375                          BPL     .-4
  749  004100  112777  000106  175074         MOVB    #'F,@LSDB
  750  004106  105777  175066                 TSTB    @LSCS
  751  004112  100375                          BPL     .-4
  752  004114  112777  000015  175060         MOVB    #15,@LSDB       ;AND ISSUE CARRIAGE RETURN
  753  004122  105777  175052                 TSTB    @LSCS           ;DONE BIT CLEAR?
  754  004126  100002                          BPL     ERR11           ;YES
  755  004130  104002                          HLT     +2              ;NO
  756                                  ;
  757                                  ;
  758  004132  104400                          SCOPE
  759  004134  005777  175040         ERR11:  TST     @LSCS           ;ERROR?
  760  004140  100002                          BPL     CRCHK3          ;NO
  761  004142  104000                          HLT     +0              ;YES
  762                                  ;
```

```
                                        ;
004144  104400                         SCOPE
004146  105777  175026                CRCHK3: TSTB    @LSCS           ;PRINTER BUSY?
004152  100401                                BMI     MOREFF          ;NO
004154  000767                                BR      ERR11           ;YES-WAIT
                                        ;
                                        ;
004156  005367  175052                MOREFF: DEC     WORK            ;DECREASE # OF FF'S
004162  005767  175046                        TST     WORK            ;HAVE WE DONE 2 FF'S
004166  001315                                BNE     FFEED1          ;NO - GO BACK & DO ANOTHER
004170  000424                                BR      SCB             ;YES - GO ON
                                        ;*****************************************************************
                                        ;
                                        ;BELL CHECKED NEXT
                                        ;
                                        ;*****************************************************************
004172  012767  004204  002176         TST14:  MOV     #BELL,RETURN    ;SET RETURN ADDRESS FOR SCOPE
004200  000401                                BR      BELL            ;IF SELECTING THIS TEST
004202  104400                         SCB:   SCOPE                   ;LOOP ON FORM FEED CHECK?
004204  112777  000007  174770         BELL:   MOVB    #7,@LSDB        ;ISSUE A BELL COMMAND
004212  105777  174762                        TSTB    @LSCS           ;DONE BIT CLEAR?
004216  100002                                BPL     ERR12           ;YES
004220  104002                                HLT     +2              ;NO
                                        ;
                                        ;
                                        ;
                                        ;
004222  104400                         ERR12:  SCOPE
004224  005777  174750                        TST     @LSCS           ;ERROR?
004230  100002                                BPL     BELLT           ;NO
004232  104000                                HLT     +0              ;YES
                                        ;
                                        ;
004234  104400                         BELLT:  SCOPE
004236  105777  174736                        TSTB    @LSCS           ;SOUND STILL HERE
004242  100401                                BMI     BELL1           ;NO
004244  000767                                BR      ERR12           ;YES-WAIT TILL DONE
                                        ;
                                        ;
004246  112777  000012  174726         BELL1:  MOVB    #012,@LSDB      ;ISSUE A LINE FEED
004254  105777  174720                        TSTB    @LSCS           ;DONE BIT CLEAR?
004260  100002                                BPL     ERR12A          ;YES
004262  104002                                HLT     +2
                                        ;
                                        ;
004264  104400                         ERR12A: SCOPE
004266  005777  174706                        TST     @LSCS           ;ERROR?
004272  100002                                BPL     LFCHK2          ;NO
004274  104000                                HLT     +0              ;YES
                                        ;
                                        ;
004276  104400                         LFCHK2: SCOPE
004300  105777  174674                        TSTB    @LSCS           ;PRINTER STILL BUSY?
004304  100401                                BMI     BELL2           ;NO
```

```
817  004306  000767                          BR      ERR12A          ;YES-WAIT
818                                  ;
819                                  ;
820  004310  112777  000102  174664  BELL2:  MOVB    #'B,@LSDB       ;LOAD BUFFER WITH 'BELL'
821  004316  105777  174656                  TSTB    @LSCS
822  004322  100375                          BPL     .-4
823  004324  112777  000105  174650          MOVB    #'E,@LSDB
824  004332  105777  174642                  TSTB    @LSCS
825  004336  100375                          BPL     .-4
826  004340  112777  000114  174634          MOVB    #'L,@LSDB       ;AND ISSUE A
827  004346  105777  174626                  TSTB    @LSCS
828  004352  100375                          BPL     .-4
829  004354  112777  000114  174620          MOVB    #'L,@LSDB
830  004362  105777  174612                  TSTB    @LSCS
831  004366  100375                          BPL     .-4
832  004370  112777  000015  174604          MOVB    #15,@LSDB       ;CARRIAGE RETURN
833  004376  105777  174576                  TSTB    @LSCS           ;DONE BIT CLEAR?
834  004402  100002                          BPL     ERR13           ;YES
835  004404  104002                          HLT     +2              ;NO
836                                  ;
837                                  ;
838  004406  104400                          SCOPE
839  004410  005777  174564          ERR13:  TST     @LSCS           ;ERROR?
840  004414  100002                          BPL     CRCHK4          ;NO
841  004416  104000                          HLT     +0              ;YES
842                                  ;
843                                  ;
844  004420  104400                          SCOPE
845  004422  105777  174552          CRCHK4: TSTB    @LSCS           ;DONE PRINTING?
846  004426  100405                          BMI     SC9             ;YES
847  004430  000767                          BR      ERR13           ;NO-WAIT
848                                  ;
849                                  ;
850
851
852                                  ;*****************************************************************************
853                                  ;
854                                  ;SECTION TO TEST PRINTING SPEEDS
855                                  ;TESTS ARE DONE USING A RELATIVE TIMING TECHNIQUE
856                                  ;5 AREAS ARE TESTED, NAMELY:
857                                  ;(A) 131 CHARACTERS/LINE
858                                  ;(B) 100 CHARACTERS/LINE
859                                  ;(C) 80 CHARACTERS/LINE
860                                  ;(D) 40 CHARACTERS/LINE
861                                  ;(E) LINE ADVANCE(SLEW RATE)
862                                  ;
863                                  ;
864                                  ;NOTE:DEPENDING ON THE VALUE IN 'COLCNT' SOME OF THE ABOVE TIMING
865                                  ;     TESTS MAY OR MAY NOT BE EXECUTED.  IF SOME ARE NOT EXECUTED,
866                                  ;     HOWEVER, THE TEST NO. WILL STILL BE PRINTED OUT.
867                                  ;
868                                  ;*****************************************************************************
869  004432  012767  004444  001736  TST15:  MOV     #CH132,RETURN   ;SET RETURN ADDRESS FOR SCOPE
870  004440  000401                          BR      CH132           ;IF SELECTING THIS TEST
```

```
871  004442  104400                    SC9:    SCOPE                   ;LOOP ON BELL CHECK?
872  004444  012767  000002  174546    CH132:  MOV     #2,LFNO         ;SETUP NO. OF LINE FEEDS COUNTER
873  004452  112777  000012  174522    AGAIN:  MOVB    #012,@LSDB      ;ISSUE A LINE FEED
874  004460  105777  174514            TSTB    @LSCS                   ;DONE BIT CLEAR?
875  004464  100002                    BPL     ERR14                   ;YES
876  004466  104002                    HLT     +2                      ;NO
877                                    ;
878                                    ;
879  004470  104400                    SCOPE
880  004472  005777  174502    ERR14:  TST     @LSCS                   ;ERROR BIT SET?
881  004476  100002                    BPL     LFCHK3                  ;NO
882  004500  104000                    HLT     +0                      ;YES
883                                    ;
884                                    ;
885  004502  104400                    SCOPE
886  004504  105777  174470    LFCHK3: TSTB    @LSCS                   ;PRINTER BUSY?
887  004510  100401                    BMI     RELF                    ;NO-ISSUE ANOTHER LINE FEED
888  004512  000767                    BR      ERR14                   ;YES
889                                    ;
890                                    ;
891  004514  005367  174500    RELF:   DEC     LFNO                    ;DECREASE NO. OF LINE FEEDS BY 1
892  004520  001401                    BEQ     CH132A                  ;MORE LINE FEEDS CALLED FOR?
893  004522  000753                    BR      AGAIN                   ;YES
894                                    ;
895                                    ;
896  004524  012701  007274    CH132A: MOV     #TITL1,R1               ;MOVE TEST TITLE INTO A BUFFER
897  004530  004767  001200            JSR     R7,TSTTAG               ;PRINT THE TITLE
898  004534  000403                    BR      .+10
899  004536  051524  030524  000065  A:      .ASCIZ  /TST15/             ;TEST NO. TO BE PRINTED OUT
900  004544  012701  004536            MOV     #A,R1                   ;MOVE ADDRESS OF TEST NO. PRINTOUT TO R1
901  004550  004767  001160            JSR     R7,TSTTAG               ;GO TO PRINT OUT TEST NO.
902  004554  005067  174472            CLR     TEST                    ;CLEAR CHARS./LINE TEST INDICATOR
903  004560  012767  000203  174446    MOV     #203,WORK               ;SET UP LINE FOR 131 CHARS.
904  004566  026767  174502  174440    CMP     COLCNT,WORK             ;IS 131 COLS. ACCESSIBLE?
905  004574  002555                    BLT     CH100                   ;NO
906  004576  012767  177700  174416  RPEAT:  MOV     #-64.,CHARS     ;SETUP NO. OF PRINTABLE CHARS.
907  004604  012767  000040  174412          MOV     #40,CHRGEN      ;SET 1ST CHAR.=SPACE
908  004612  116777  174406  174362  CH132F: MOVB    CHRGEN,@LSDB    ;LOAD CHAR. INTO BUFFER
909  004620  105777  174354            TSTB    @LSCS                   ;WAIT FOR LOADING
910  004624  100375                    BPL     .-4
911  004626  005367  174402            DEC     WORK                    ;DECREASE NO. OF CHARS./LINE
912  004632  005767  174376            TST     WORK                    ;IS LINE FULL?
913  004636  001417                    BEQ     TIMING                  ;YES - GET SET TO PRINT & MONITOR RELATIVE TIME
914  004640  005767  174356            TST     CHARS                   ;START AT 1ST CHAR. ALL OVER?
915  004644  001405                    BEQ     STOVER                  ;YES - 64 CHARS./LINE DEPLETED BUT LINE NOT FULL YET!
916  004646  005267  174350            INC     CHARS                   ;NO-DECREASE CHAR. COUNT
917  004652  005267  174346            INC     CHRGEN                  ;GET NEXT CHARACTER
918  004656  000755                    BR      CH132F                  ;GO BACK TO LOAD BUFFER
919  004660  012767  177700  174334  STOVER: MOV     #-64.,CHARS     ;RESET CHARACTER COUNT
920  004666  012767  000040  174330          MOV     #40,CHRGEN      ;RESET TO START OVER AGAIN
921  004674  000746                    BR      CH132F                  ;KEEP LOADING CHARS.
922                                    ;
923                                    ;
924  004676  112777  000012  174276  TIMING: MOVB    #12,@LSDB       ;ISSUE A LINE FEED
```

```
  925  004704  005067  174330          TIM132: CLR     CYCLE           ;CLEAR 1000 TIME LOOP COUNTER
  926  004710  005267  174314                  INC     TIMER           ;RELATIVE TIME COUNTER
  927  004714  105777  174260                  TSTB    @#LSCS          ;DONE BIT SET?
  928  004720  100416                          BMI     RTTYP           ;YES-LINE HAS BEEN PRINTED
  929  004722  005267  174312          CYCNT:  INC     CYCLE           ;NO-CONTINUE LOOP COUNTING
  930  004726  022767  001750  174304          CMP     #1000.,CYCLE    ;1000 TIMES THRU LOOP?
  931  004734  001763                          BEQ     TIM132          ;YES - INCREMENT RELATIVE TIME COUNT
  932                                                                  ;AND CLEAR 1000X LOOP COUNTER
  933  004736  105777  174236                  TSTB    @#LSCS          ;DONE BIT SET?
  934  004742  100760                          BMI     TIM132          ;YES - LINE HAS BEEN PRINTED
  935  004744  005777  174230                  TST     @#LSCS          ;NO - ERROR BIT SET?
  936  004750  100364                          BPL     CYCNT           ;NO - KEEP CYCLING
  937  004752  104000                          HLT     +0              ;YES
  938
  939
  940                                  ;
  941                                  ;
  942  004754  104400                          SCOPE
  943  004756  012701  007356          RTTYP:  MOV     #TITL2,R1       ;MOVE RESULT TITLE INTO A BUFFER
  944  004762  105711                  CTST:   TSTB    (R1)            ;IS CHAR, A 0 SYMBOL?
  945  004764  001406                          BEQ     CTST1           ;YES-PICK UP TIME COUNT FROM TIMING ROUTINE
  946  004766  112177  174210                  MOVB    (R1)+,@#LSDB    ;NO-LOAD CHAR,
  947  004772  105777  174202                  TSTB    @#LSCS          ;WAIT FOR CHAR, TO LOAD
  948  004776  100375                          BPL     .-4
  949  005000  000770                          BR      CTST            ;LOOK AT NEXT CHAR',
  950  005002  016767  174222  174222  CTST1:  MOV     TIMER,WAREA     ;MOVE TIME COUNT INTO A WORK AREA
  951  005010  005067  174214                  CLR     TIMER           ;RESET TIME COUNTER
  952  005014  004367  000572                  JSR     R3,OCTDEC       ;CONVERT OCTAL TO ASCII 7-BIT DECIMAL
  953                                                                  ;AND LOAD INTO PRINTER BUFFER
  954  005020  112777  000012  174154          MOVB    #12,@#LSDB      ;ISSUE A LINE FEED
  955  005026  105777  174146                  TSTB    @#LSCS          ;DONE BIT CLEAR
  956  005032  100002                          BPL     ERR18           ;YES
  957  005034  104002                          HLT     +2              ;NO
  958                                  ;
  959                                  ;
  960  005036  104400                          SCOPE
  961  005040  005777  174134          ERR18:  TST     @#LSCS          ;ERROR?
  962  005044  100002                          BPL     CRCHK6          ;NO
  963  005046  104000                          HLT     +0              ;YES
  964                                  ;
  965                                  ;
  966  005050  104400                          SCOPE
  967  005052  105777  174122          CRCHK6: TSTB    @#LSCS          ;PRINTER BUSY PRINTING?
  968  005056  100401                          BMI     MORE            ;NO
  969  005060  000767                          BR      ERR18           ;YES
  970
  971
  972                                  ;
  973  005062  022767  000000  174162  MORE:   CMP     #0,TEST
  974  005070  001416                          BEQ     SC10            ;DO 100 CHARS/LINE
  975  005072  022767  000001  174152          CMP     #1,TEST
  976  005100  001443                          BEQ     SC11            ;DO 80 CHARS/LINE
  977  005102  022767  000002  174142          CMP     #2,TEST
  978  005110  001470                          BEQ     SC12            ;DO 40 CHARS/LINE
```

```
  979  005112  200167  000236                JMP     SC13            ;CHARS',/LINE TEST ALL DONE = GO TO NEXT TEST
  980                                  ;*****************************************************************
  981                                  ;
  982                                  ;RELATIVE TIME OF 100 CHARS,/LINE CHECKED NEXT
  983                                  ;
  984                                  ;*****************************************************************
  985  005116  012767  005130  001252  TST16:  MOV     #CH100,RETURN   ;SET RETURN ADDRESS FOR SCOPE
  986  005124  000401                          BR      CH100           ;IF SELECTING THIS TEST
  987  005126  104430                  SC10:   SCOPE                   ;LOOP ON 132 CHARS',/LINE TIMING CHECK?
  988  005130  000403                  CH100:  BR      .+10
  989  005132  051524  030524  000066  B:      .ASCIZ  /TST16/         ;TEST NO, TO BE PRINTED OUT
  990  005140  012701  005132                  MOV     #B,R1           ;MOVE ADDRESS OF TEST NO, PRINTOUT TO R1
  991  005144  004767  000564                  JSR     R7,TSTTAG       ;GO TO PRINT OUT TEST NO,
  992  005150  012767  000001  174074          MOV     #1,TEST
  993  005156  012767  000144  174050          MOV     #144,WORK       ;SET UP LINE FOR 100 CHARS',
  994  005164  026767  174104  174042          CMP     COLCNT,WORK     ;IS 100 COLS, ACCESSIBLE?
  995  005172  002407                          BLT     CH80            ;NO
  996  005174  000167  177376                  JMP     RPEAT           ;GO BACK TO TIME 100 CHARS',/LINE
  997                                  ;*****************************************************************
  998                                  ;
  999                                  ;RELATIVE TIME OF 80 CHARS',/LINE CHECKED NEXT
 1000                                  ;
 1001                                  ;*****************************************************************
 1002  005200  012767  005212  001170  TST17:  MOV     #CH80,RETURN    ;SET RETURN ADDRESS FOR SCOPE
 1003  005206  000401                          BR      CH80            ;IF SELECTING THIS TEST
 1004  005210  104400                  SC11:   SCOPE                   ;LOOP ON 100 CHARS',/LINE TIMING CHECK?
 1005  005212  000403                  CH80:   BR      .+10
 1006  005214  051524  030524  000067  C:      .ASCIZ  /TST17/         ;TEST NO, TO BE PRINTED OUT
 1007  005222  012701  005214                  MOV     #C,R1           ;MOVE ADDRESS OF TEST NO, PRINTOUT TO R1
 1008  005226  004767  000502                  JSR     R7,TSTTAG       ;GO TO PRINT OUT TEST NO,
 1009  005232  012767  000002  174012          MOV     #2,TEST
 1010  005240  012767  000120  173766          MOV     #120,WORK       ;SET UP LINE FOR 80 CHARS,
 1011  005246  026767  174022  173760          CMP     COLCNT,WORK     ;IS 80 COLS, ACCESSIBLE?
 1012  005254  002407                          BLT     CH40            ;NO
 1013  005256  000167  177314                  JMP     RPEAT           ;GO BACK TO TIME 80 CHARS,/LINE
 1014                                  ;*****************************************************************
 1015                                  ;
 1016                                  ;RELATIVE TIME OF 40 CHARS',/LINE CHECKED NEXT
 1017                                  ;
 1018                                  ;*****************************************************************
 1019  005262  012767  005274  001106  TST20:  MOV     #CH40,RETURN    ;SET RETURN ADDRESS FOR SCOPE
 1020  005270  000401                          BR      CH40            ;IF SELECTING THIS TEST
 1021  005272  104400                  SC12:   SCOPE                   ;LOOP ON 80 CHARS,/LINE TIMING CHECK?
 1022  005274  000403                  CH40:   BR      .+10
 1023  005276  051524  031124  000060  D:      .ASCIZ  /TST20/         ;TEST NO, TO BE PRINTED OUT
 1024  005304  012701  005276                  MOV     #D,R1           ;MOVE ADDRESS OF TEST NO, PRINTOUT TO R1
 1025  005310  004767  000420                  JSR     R7,TSTTAG       ;GO TO PRINT OUT TEST NO,
 1026  005314  012767  000003  173730          MOV     #3,TEST
 1027  005322  012767  000050  173704          MOV     #50,WORK        ;SET UP LINE FOR 40 CHARS,
 1028  005330  026767  173740  173676          CMP     COLCNT,WORK     ;IS 40 COLS, ACCESSIBLE?
 1029  005336  002406                          BLT     SC13            ;NO
 1030  005340  000167  177232                  JMP     RPEAT           ;GO BACK TO TIME 40 CHARS,/LINE
 1031                                  ;
 1032                                  ;*****************************************************************
```

```
1033                                    ;
1034                                    ;RELATIVE TIME OF SLEW RATE CHECKED NEXT
1035                                    ;
1036                                    ;*****************************************************************
1037                                    ;
1038  005344  012767  005356  001024  TST21: MOV     #LFRATE,RETURN  ;SET RETURN ADDRESS FOR SCOPE
1039  005352  000401                    BR      LFRATE          ;IF SELECTING THIS TEST
1040  005354  104400                    SC13:   SCOPE           ;LOOP ON 40 CHARS,/LINE TIMING CHECK?
1041  005356  000403                    LFRATE: BR      .+10
1042  005360  051524  031124  000061  E1      ,ASCIZ  /TST21/         ;TEST NO, TO BE PRINTED OUT
1043  005366  012701  005360            MOV     #E,R1           ;MOVE ADDRESS OF TEST NO, PRINTOUT TO R1
1044  005372  004767  000336            JSR     R7,TSTTAG       ;GO TO PRINT OUT TEST NO,
1045  005376  012701  007402            MOV     #TITL3,R1       ;MOVE TEST TITLE INTO A BUFFER
1046  005402  105711                    LFRAT1: TSTB    (R1)            ;IS CHAR, A @ SYMBOL?
1047  005404  001406                    BEQ     LFRAT2          ;YES-ISSUE A 'CR'
1048  005406  112177  173570            MOVB    (R1)+,@LSDB     ;NO-LOAD CHAR,
1049  005412  105777  173562            TSTB    @LSCS           ;WAIT FOR LOADING
1050  005416  100375                    BPL     .-4
1051  005420  000770                    BR      LFRAT1          ;LOOK AT NEXT CHAR
1052  005422  112777  000015  173552  LFRAT2: MOVB    #15,@LSDB       ;ISSUE A CARRIAGE RETURN
1053  005430  105777  173544            TSTB    @LSCS           ;WAIT FOR EXECUTION
1054  005434  100375                    BPL     .-4
1055  005436  112777  000012  173536            MOVB    #12,@LSDB       ;ISSUE A LINE FEED-80MS
1056  005444  004467  000364            JSR     R4,WOFLAG       ;KEEP A RELATIVE TIME COUNT
1057  005450  112777  000012  173524            MOVB    #12,@LSDB       ;ISSUE 2ND LINE FEED-40MS
1058  005456  004467  000356            JSR     R4,SLEWT        ;KEEP ON WITH RELATIVE TIME COUNTING
1059  005462  012701  007356            MOV     #TITL2,R1       ;MOVE RESULT TITLE INTO A BUFFER
1060  005466  112777  000012  173506            MOVB    #12,@LSDB       ;ISSUE A LINE FEED
1061  005474  105777  173500            TSTB    @LSCS           ;WAIT FOR EXECUTION
1062  005500  100375                    BPL     .-4
1063  005502  016767  173522  173522            MOV     TIMER,WAREA     ;MOVE TIME COUNT INTO A WORK AREA
1064  005510  005067  173524            CLR     CYCLE           ;CLEAR 1000X LOOP COUNTER
1065  005514  005067  173510            CLR     TIMER           ;CLEAR TIME COUNT
1066  005520  105777  173454  RLOAD:  TSTB    @LSCS   ;IS PRINTER READY?
1067  005524  100375                    BPL     .-4
1068  005526  105711                    TSTB    (R1)            ;GET A CHAR, OF RESULT TITLE
1069  005530  001403                    BEQ     CONT            ;GO TO DECODE TIME COUNT IF IT IS A '@' SYMBOL
1070  005532  112177  173444            MOVB    (R1)+,@LSDB     ;IF IT ISN'T A '@' LOAD IT INTO PRINTER
1071  005536  000770                    BR      RLOAD           ;GO TO LOOK AT NEXT CHAR,
1072  005540  004367  000046  CONT:   JSR     R3,OCTDEC       ;DECODE TIME COUNT
1073  005544  112777  000012  173430            MOVB    #12,@LSDB       ;ISSUE A LINE FEED TO PRINT RESULT
1074  005552  105777  173422            TSTB    @LSCS           ;DONE BIT SET?
1075  005556  100002                    BPL     ERR19           ;NO - CHECK FOR ANY ERROR
1076  005560  104002                    HLT     +2              ;YES - IT IS SET
1077                                    ;
1078                                    ;
1079  005562  104400                    SCOPE
1080  005564  005777  173410  ERR19:  TST     @LSCS           ;ANY ERROR?
1081  005570  100002                    BPL     CRCHK7          ;NO - CHECK TO SEE IF PRINTER STILL BUSY
1082  005572  104000                    HLT     +0              ;YES - AN ERROR OCCURRED
1083                                    ;
1084                                    ;
1085  005574  104400                    SCOPE
1086  005576  105777  173376  CRCHK7: TSTB    @LSCS           ;PRINTER STILL BUSY?
```

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 1087  005602  100401                          BMI     XERSIZ          ;NO - PROCEED TO NEXT TEST
 1088  005604  000767                          BR      ERR19           ;YES - WAIT
 1089  005606  000167  003612          XERSIZ: JMP     SC14
 1090                                  ;*****************************************************************
 1091                                  ;
 1092                                  ;SUBROUTINE TO CONVERT AN OCTAL NUMBER
 1093                                  ;TO AN ASCII 7-BIT DECIMAL VALUE AND LOAD THE
 1094                                  ;RESULTS INTO THE CENTRONICS PRINTER BUFFER
 1095                                  ;
 1096                                  ;*****************************************************************
 1097  005612  116702  173414          OCTDEC: MOVB    WAREA,R2        ;MOVE TIME COUNT TO A REGISTER
 1098  005616  012704  005726                  MOV     #ADTENP,R4      ;MOVE POWERS OF TEN ADDRESS TO A REGISTER
 1099  005622  012767  000003  000070          MOV     #3,CNVCTR       ;SET POWER CONVERSION COUNTER
 1100  005630  012467  000070          BDCNVA: MOV     (R4)+,TENPWR    ;MOVE TENS POWER TO A WORK AREA
 1101  005634  004767  000010                  JSR     R7,SUBTEN       ;DO THE CONVERSION
 1102  005640  005367  000054                  DEC     CNVCTR          ;DECREASE CONVERSION COUNTER
 1103  005644  001371                          BNE     BDCNVA          ;ARE WE DONE CONVERTING?
 1104  005646  000203                          RTS     R3              ;YES
 1105  005650  005067  000046          SUBTEN: CLR     DIGIT           ;CLEAR CONVERTED ANSWER AREA
 1106  005654  166702  000044          SUBTNA: SUB     TENPWR,R2       ;SUBTRACT TENS POWER FROM OCTAL VALUE
 1107  005660  103403                          BCS     SUBTNB          ;BRANCH IF CARRY BIT SET
 1108  005662  005267  000034                  INC     DIGIT           ;OTHERWISE INCREMENT CONVERTED ANSWER
 1109  005666  000772                          BR      SUBTNA          ;AND BRANCH BACK TO SUBTRACT AGAIN
 1110  005670  066702  000030          SUBTNB: ADD     TENPWR,R2       ;ADD BACK LAST SUBTRACTION
 1111  005674  062767  000060  000020          ADD     #60,DIGIT       ;CONVERT TO ASCII
 1112  005702  116777  000014  173272          MOVB    DIGIT,@LSDB     ;MOVE DIGIT INTO PRINTER BUFFER
 1113  005710  105777  173264                  TSTB    @LSCS           ;WAIT FOR EXECUTION
 1114  005714  100375                          BPL     .-4
 1115  005716  000207                          RTS     R7              ;BRANCH BACK TO PICK UP NEXT DIGIT
 1116                                  ;
 1117                                  ;
 1118  005720  000000          CNVCTR: 0                               ;CONVERSION COUNTER
 1119  005722  000000          DIGIT:  0                               ;CONVERTED ANSWER/DIGIT
 1120  005724  000000          TENPWR: 0                               ;TENS POWER FOR CONVERSION
 1121  005726  000144          ADTENP: 100.                            ;TEN TO THE 2 POWER
 1122  005730  000012                  10.                             ;TEN TO THE 1 POWER
 1123  005732  000001                  1.                              ;TEN TO THE 0 POWER
 1124                                  ;*****************************************************************
 1125                                  ;
 1126                                  ;SUBROUTINE TO PRINT OUT TEST NOS, & TEST TITLES
 1127                                  ;
 1128                                  ;*****************************************************************
 1129  005734  112777  000012  173240  TSTTAG: MOVB    #12,@LSDB       ;ISSUE A LINE FEED
 1130  005742  105777  173232                  TSTB    @LSCS           ;WAIT FOR EXECUTION
 1131  005746  100375                          BPL     .-4
 1132  005750  105711                  TAG1:   TSTB    (R1)            ;LOOK AT A CHAR, OF PRINTOUT
 1133  005752  001406                          BEQ     TAG2            ;IF LAST CHAR, OF PRINTOUT ISSUE A LF
 1134  005754  112177  173222                  MOVB    (R1)+,@LSDB     ;OTHERWISE, LOAD INTO PRINTER BUFFER
 1135  005760  105777  173214                  TSTB    @LSCS           ;AND WAIT FOR LOADING
 1136  005764  100375                          BPL     .-4
 1137  005766  000770                          BR      TAG1            ;GO BACK TO LOOK AT ANOTHER CHAR,
 1138  005770  112777  000012  173204  TAG2:   MOVB    #12,@LSDB       ;ISSUE A LINE FEED TO PRINT TEST NO,
 1139  005776  105777  173176                  TSTB    @LSCS           ;DONE BIT CLEAR?
 1140  006002  100002                          BPL     ERR20           ;YES
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1141  006004  104002                        HLT     +2              ;NO
1142                                  ;
1143                                  ;
1144  006006  104400                        SCOPE
1145  006010  005777  173164       ERR20:  TST     @LSCS           ;ERROR BIT SET?
1146  006014  100002                        BPL     TAG3            ;NO
1147  006016  104000                        HLT     +0              ;YES
1148                                  ;
1149                                  ;
1150  006020  104400                        SCOPE
1151  006022  105777  173152       TAG3:   TSTB    @LSCS           ;PRINTER STILL BUSY?
1152  006026  100401                        BMI     TAG4            ;NO
1153  006030  000767                        BR      ERR20           ;YES
1154                                  ;
1155                                  ;
1156  006032  000207                TAG4:   RTS     R7              ;RETURN TO NORMAL PROGRAM FLOW
1157                                  ;*****************************************************************
1158                                  ;
1159                                  ;SUBROUTINE TO CYCLE TIME FOR SLEW RATE TESTING
1160                                  ;
1161                                  ;*****************************************************************
1162  006034  005067  173200       WOFLAG: CLR     CYCLE           ;CLEAR 1000X LOOP COUNTER
1163  006040  005267  173164       SLEWT:  INC     TIMER           ;INCREMENT THE TIME COUNT
1164  006044  105777  173130               TSTB    @LSCS           ;PRINTER DONE?
1165  006050  100415                        BMI     SECLF           ;YES - RETURN
1166  006052  005267  173162       CYCLE1: INC     CYCLE           ;NO - INCREMENT 1000X LOOP COUNTER
1167  006056  022767  001750  173154        CMP     #1000.,CYCLE    ;HAVE WE LOOPED 1000X?
1168  006064  001763                        BEQ     WOFLAG          ;YES - GO BACK TO INCREMENT TIME COUNT
1169                                                                ;AND TEST THE DONE BIT
1170  006066  105777  173106               TSTB    @LSCS           ;NO - IS PRINTER DONE?
1171  006072  100762                        BMI     SLEWT           ;YES - INCREMENT TIME COUNT
1172  006074  005777  173100               TST     @LSCS           ;DID ANY ERROR OCCUR?
1173  006100  100364                        BPL     CYCLE1          ;NO - KEEP WITHIN 1000X LOOP COUNT
1174  006102  104000                        HLT     +0              ;YES - AN ERROR OCCURRED
1175  006104  000204                SECLF:  RTS     R4              ;RETURN
1176                                  ;*****************************************************************
1177                                  ;
1178                                  ;AVERAGE TIME WAIT ROUTINE FOR CHECKING THAT THE
1179                                  ;DONE BIT FUNCTIONS PROPERLY BEFORE
1180                                  ;GOING ON TO FURTHER PROGRAM TESTING.
1181                                  ;IF THE DONE BIT DOESN'T SET WITHIN
1182                                  ;THE MORE THAN AMPLE TIME ALLOWED, THEN A
1183                                  ;MESSAGE WILL BE TYPED OUT ON THE TTY INDICATING
1184                                  ;A PROBLEM E.G. DONE BIT NEVER SET
1185                                  ;
1186                                  ;*****************************************************************
1187  006106  016767  173154  173120 WAITON: MOV     DELAY,WORK      ;SET A WAIT VALUE OF X'TIMES THRU LOOP
1188  006114  005267  173114        INCR1:  INC     WORK            ;INCREMENT THE PASS THRU LOOP
1189  006120  005767  173110                TST     WORK            ;DID WE LOOP X'TIMES WITHOUT DONE RESETTING?
1190  006124  001405                        BEQ     ALMOST          ;YES
1191  006126  105777  173046               TSTB    @LSCS           ;NO - STILL OK!
1192  006132  100401                        BMI     FINI            ;RETURN IF DONE BIT SET
1193  006134  000767                        BR      INCR1           ;IF NOT READY INCREMENT LOOP
1194  006136  000204                FINI:   RTS     R4              ;OK - RETURN WHERE LEFT OFF
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 1195  006140  104005                  ALMOST: HLT     +5              ;NOT QUITE! TOOK TOO LONG
 1196  006142  000204                          RTS     R4              ;RETURN
 1197                                  ;*****************************************************************
 1198                                  ;
 1199                                  ;SUBROUTINE TO OUTPUT ASCII MESSAGES ON TELETYPE
 1200                                  ;
 1201                                  ;*****************************************************************
 1202  006144  011600                  TYP:    MOV     @R6,R0          ;GET MESSAGE ADDRESS
 1203  006146  062716  000002                  ADD     #2,@R6          ;SET UP EXIT LOCATION
 1204                                                                  ;I.E. = LOCATION AFTER MESSAGE ADDRESS
 1205  006152  011000                          MOV     @R0,R0          ;SET UP FOR 1ST CHAR. OF MESSAGE
 1206  006154  112777  000015  173024          MOVB    #15,@TPB        ;ISSUE A CARRIAGE RETURN
 1207  006162  105777  173022                  TSTB    @TPS            ;WAIT FOR EXECUTION
 1208  006166  100375                          BPL     .-4
 1209  006170  112777  000012  173010          MOVB    #12,@TPB        ;ISSUE A LINE FEED
 1210  006176  105777  173006                  TSTB    @TPS            ;WAIT FOR EXECUTION
 1211  006202  100375                          BPL     .-4
 1212  006204  112067  173026          TYPA:   MOVB    (R0)+,TYPDAT    ;GET A CHARACTER
 1213  006210  122767  000000  173020          CMPB    #0,TYPDAT       ;IS IT A 0?
 1214  006216  001007                          BNE     TYPB            ;NO - GO AND PRINT IT
 1215  006220  012777  177777  172760          MOV     #-1,@TPB        ;ISSUE A -1 FOR DOUBLE BUFFERED UART
 1216  006226  105777  172756                  TSTB    @TPS            ;WAIT FOR EXECUTION
 1217  006232  100375                          BPL     .-4
 1218  006234  000002                          RTI                     ;YES - RETURN FROM EMT CALL
 1219  006236  116777  172774  172742  TYPB:   MOVB    TYPDAT,@TPB     ;MOVE CHARACTER INTO TTY BUFFER
 1220  006244  105777  172740                  TSTB    @TPS            ;WAIT FOR EXECUTION
 1221  006250  100375                          BPL     .-4
 1222  006252  000754                          BR      TYPA            ;GET ANOTHER CHARACTER
 1223                                  ;*****************************************************************
 1224                                  ;
 1225                                  ;SCOPE ROUTINE TO LOOP ON TEST
 1226                                  ;
 1227                                  ;*****************************************************************
 1228  006254  005767  173002          SCOPEC: TST     ICOUNT          ;DO WE WANT ITERATIONS?
 1229  006260  001420                          BEQ     SCOPEF          ;NO - SEE IF WE WANT TO LOOP!
 1230  006262  005767  172776                  TST     ERRIND          ;YES - SEE IF ERROR OCCURRED PREVIOUSLY
 1231  006266  001015                          BNE     SCOPEF          ;IT DID! DON'T ITERATE
 1232  006270  021627  003102                  CMP     (R6),#CARRET    ;NO ERROR OCCURRED - SEE IF WE WANT TO
 1233                                                                  ;ITERATE 1X OR X'TIMES
 1234  006274  101012                          BHI     SCOPEF          ;ITERATE 1X
 1235  006276  005367  172754                  DEC     ICNT            ;BEGIN ITERATING X'TIMES OR TILL
 1236                                                                  ;AN ERROR OCCURS
 1237  006302  016700  172750                  MOV     ICNT,R0         ;FLASH SOME LIGHTS
 1238  006306  005767  172744                  TST     ICNT            ;ARE WE DONE?
 1239  006312  001032                          BNE     SCOPEB          ;NO - KEEP ITERATING!
 1240  006314  016767  172740  172734          MOV     REICNT,ICNT     ;YES - RESTORE ITERATION COUNT
 1241  006322  032767  040000  171240  SCOPEF: BIT     #40000,SWR      ;LOOP ON TEST?
 1242  006330  001023                          BNE     SCOPEB          ;YES - RESET STACK & REDO TEST
 1243  006332  000411                          BR      SCOPEG          ;NOP FOR XOR TESTER
 1244                                  ;
 1245                                  ;
 1246  006334  013746  000004                  MOV     @#4,-(R6)       ;SAVE TRAPCATCHER
 1247  006340  012737  006400  000004          MOV     #SCOPEB,@#4     ;SET UP TO REDO TEST IF ERROR OCCURS
 1248  006346  005737  177060                  TST     @#177060        ;TIMEOUT ERROR?
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1249  006352  012637  000004                MOV     (R6)+,@#4       ;NO - RESTORE TRAPCATCHER & CONTINUE TESTING
1250                                        ;
1251                                        ;
1252  006356  011667  000014        SCOPEG: MOV     @R6,RETURN      ;SAVE THE RETURN ADDRESS OF NEXT TEST
1253  006362  005067  172676                CLR     ERRIND          ;CLEAR ERROR INDICATOR
1254  006366  016767  172666  172662        MOV     REICNT,ICNT     ;RESTORE ITERATION COUNT
1255  006374  000002                        RTI                     ;RETURN TO CONTINUE TESTING
1256  006376  000000        RETURN: .WORD   0
1257  006400  005726        SCOPEB: TST     (R6)+                   ;RESET STACK AND OLD
1258  006402  012677  172576                MOV     (R6)+,@PSW      ;PROCESSOR STATUS WORD
1259  006406  000177  177764                JMP     @RETURN         ;RETURN TO REDO A TEST
1260                                        ;**************************************************************************
1261                                        ;
1262                                        ;SUBROUTINE FOR ERROR PRINTOUT
1263                                        ;IT IS OF THE FORM:
1264                                        ;PC = XXXXX  'ERROR MESSAGE'
1265                                        ;
1266                                        ;**************************************************************************
1267  006412  012767  000001  172644 ERROR: MOV     #1,ERRIND       ;SET ERROR INDICATOR
1268  006420  010067  172644                MOV     R0,ADDERR       ;IF AN ERROR OCCURRED IN TST1 THEN
1269                                                                 ;'ADDERR' WILL CONTAIN THE ADDRESS OF
1270                                                                 ;THE ADDRESS ERROR
1271  006424  036727  171140  020000        BIT     SWR,#20000      ;INHIBIT ERROR PRINTOUT?
1272  006432  001401                        BEQ     .+4             ;NO - PRINT CONTENTS OF PC
1273  006434  000002                        RTI
1274  006436  105777  172546              1$: TSTB    @TPS            ;WAIT FOR EXECUTION
1275  006442  100375                        BPL     1$
1276  006444  000004                        TYPE                    ;TYPE THE ERROR MESSAGE
1277  006446  010252                        ERRORM                  ;PC= /
1278  006450  011667  172616                MOV     (R6),SAVEPC     ;SAVE PC + LOCATION AFTER HLT
1279  006454  016705  172612                MOV     SAVEPC,R5       ;SAVE PC OF HLT FOR ERROR MESSAGE USE
1280  006460  004467  000014                JSR     R4,DECPC        ;DECODE ACTUAL PC FOR TELETYPE PRINTOUT
1281  006464  036727  171100  100000        BIT     SWR,#100000     ;DO WE WANT TO HALT ON ERROR?
1282  006472  001401                        BEQ     .+4             ;NO - CONTINUE TESTING
1283  006474  000000                        HALT                    ;HALT ON ERROR
1284  006476  000002                        RTI                     ;RETURN TO TESTING
1285                                        ;
1286                                        ;
1287  006500  012701  000500        DECPC:  MOV     #500,R1         ;SET STARTING LOCATION FOR LOADING OF DECODED PC
1288  006504  116702  172562        REIT:   MOVB    SAVEPC,R2       ;MOVE PC (OCTAL) INTO REGISTER 2
1289  006510  042702  177770                BIC     #177770,R2      ;MASK OUT ALL BUT RIGHTMOST DIGIT
1290  006514  062702  000060                ADD     #60,R2          ;CONVERT TO 7-BIT ASCII OCTAL
1291  006520  110241                        MOVB    R2,-(R1)        ;SAVE THE CONVERTED DIGIT
1292                                                                 ;STARTING AT LOCATION 500
1293  006522  000241                        CLC
1294  006524  006067  172542                ROR     SAVEPC          ;SHIFT OVER PC
1295  006530  000241                        CLC
1296  006532  006067  172534                ROR     SAVEPC          ;3X
1297  006536  000241                        CLC
1298  006540  006067  172526                ROR     SAVEPC          ;TO GET NEXT DIGIT FOR CONVERSION
1299  006544  022767  000000  172520        CMP     #0,SAVEPC       ;IS WHAT'S LEFT OF PC EQUAL TO 0?
1300  006552  001401                        BEQ     TTYLD           ;YES - GO TO LOAD BUFFER WITH CONVERTED PC
1301  006554  000753                        BR      REIT            ;NO - GO TO CONVERT NEXT RIGHTMOST DIGIT
1302                                        ;
```

```
1303                                        ;
1304  006556  112177  172424          TTYLD:  MOVB    (R1)+,@TPB      ;MOVE CONVERTED PC INTO TELETYPE BUFFER
1305                                                                  ;STARTING WITH THE LEFTMOST DIGIT
1306  006562  105777  172422                  TSTB    @TPS            ;WAIT FOR EXECUTION
1307  006566  100375                          BPL     .-4
1308  006570  022701  000500                  CMP     #500,R1         ;HAVE WE GOT THE WHOLE PC?
1309  006574  001424                          BEQ     TTYMSG          ;YES - PRINT ERROR MESSAGE ASSOCIATED WITH HLT
1310  006576  000767                          BR      TTYLD           ;NO - KEEP LOADING PC
1311  006600  112777  000015  172400  ERROR1: MOVB    #15,@TPB        ;ISSUE A CARRIAGE RETURN
1312  006606  105777  172376                  TSTB    @TPS            ;WAIT FOR EXECUTION
1313  006612  100375                          BPL     .-4
1314  006614  112777  000012  172364          MOVB    #12,@TPB        ;ISSUE A LINE FEED
1315  006622  105777  172362                  TSTB    @TPS            ;WAIT FOR EXECUTION
1316  006626  100375                          BPL     .-4
1317  006630  012777  177777  172350          MOV     #-1,@TPB        ;ISSUE A -1 FOR DOUBLE BUFFERED UART
1318  006636  105777  172346                  TSTB    @TPS            ;WAIT FOR EXECUTION
1319  006642  100375                          BPL     .-4
1320  006644  000204                          RTS     R4              ;RETURN
1321  006646  010567  000054          TTYMSG: MOV     R5,HLTADD       ;GET THE PROGRAM COUNTER
1322  006652  162767  000002  000046          SUB     #2,HLTADD       ;SUBTRACT 1 WORD TO GET ACTUAL HLT
1323  006660  117703  000042                  MOVB    @HLTADD,R3      ;STORE ERROR MESSAGE NUMBER
1324  006664  006303                          ASL     R3              ;SHIFT MESSAGE NO. TO GET PROPER WORD COUNT
1325  006666  016301  014354                  MOV     MSGTAB(R3),R1   ;STORE ERROR MESSAGE ADDRESS
1326  006672  112167  172340          MSGA:   MOVB    (R1)+,TYPDAT    ;LOOK AT A CHARACTER
1327  006676  122767  000000  172332          CMPB    #0,TYPDAT       ;IS IT A 0 SYMBOL?
1328  006704  001001                          BNE     MSGB            ;NO - LOAD THE CHARACTER
1329  006706  000734                          BR      ERROR1          ;YES - MESSAGE DONE
1330  006710  116777  172322  172270  MSGB:   MOVB    TYPDAT,@TPB     ;MOVE CHAR. INTO TELETYPE BUFFER
1331  006716  105777  172266                  TSTB    @TPS            ;WAIT FOR EXECUTION
1332  006722  100375                          BPL     .-4
1333  006724  000762                          BR      MSGA            ;LOOK AT NEXT CHARACTER
1334                                        ;
1335                                        ;
1336  006726  000000                    HLTADD: 0
1337                                        ;*****************************************************************
1338                                        ;
1339                                        ;INITIAL TELETYPE MESSAGES
1340                                        ;
1341                                        ;*****************************************************************
1342  006730  040515  047111  042504  MES1:   .ASCIZ  /MAINDEC-11-DZLSAA/
1343  006736  026503  030461  042055
1344  006744  046132  040523  000101
1345                                        .EVEN
1346  006752  042523  042514  052103  MES2:   .ASCIZ  /SELECT PRINTER ON LINE/
1347  006760  050040  044522  052116
1348  006766  051105  047440  020116
1349  006774  044514  042516     000
1350          007002                        .EVEN
1351  007002  044510  020124  047503  MES3:   .ASCIZ  /HIT CONTINUE SWITCH TO RESUME OPERATION/
1352  007010  052116  047111  042525
1353  007016  051440  044527  041524
1354  007024  020110  047524  051040
1355  007032  051505  046525  020105
1356  007040  050117  051105  052101
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 1357  007046  047511  000116
 1358                                          ,EVEN
 1359  007052  050117  047105  043040  MES4:   ,ASCIZ  /OPEN FRONT PANEL & HIT TOP OF FORM - PAPER SHOULD NOT ADVANCE/
 1360  007060  047522  052116  050040
 1361  007066  047101  046105  023040
 1362  007074  044040  052111  052040
 1363  007102  050117  047440  020106
 1364  007110  047506  046522  026440
 1365  007116  050040  050101  051105
 1366  007124  051440  047510  046125
 1367  007132  020104  047516  020124
 1368  007140  042101  040526  041516
 1369  007146  000105
 1370                                          ,EVEN
 1371  007150  042522  047515  042526  MES5:   ,ASCIZ  /REMOVE PAPER/
 1372  007156  050040  050101  051105
 1373  007164     000
 1374          007166                          ,EVEN
 1375  007166  052520  020124  040520  MES6:   ,ASCIZ  /PUT PAPER BACK/
 1376  007174  042520  020122  040502
 1377  007202  045503     000
 1378          007206                          ,EVEN
 1379  007206  047111  042523  052122  MES7:   ,ASCIZ  /INSERT CODE FOR DESIRED CHARACTER IN SWITCH REGISTER/
 1380  007214  041440  042117  020105
 1381  007222  047506  020122  042504
 1382  007230  044523  042522  020104
 1383  007236  044103  051101  041501
 1384  007244  042524  020122  047111
 1385  007252  051440  044527  041524
 1386  007260  020110  042522  044507
 1387  007266  052123  051105     000
 1388          007274                          ,EVEN
 1389                                  ;*****************************************************************
 1390                                  ;
 1391                                  ;CENTRONICS TEST TITLES
 1392                                  ;
 1393                                  ;*****************************************************************
 1394  007274  042522  040514  044524  TITL1:  ,ASCIZ  /RELATIVE TIMING TESTS FOR DIFFERENT LINE LENGTHS/
 1395  007302  042526  052040  046511
 1396  007310  047111  020107  042524
 1397  007316  052123  020123  047506
 1398  007324  020122  044504  043106
 1399  007332  051105  047105  020124
 1400  007340  044514  042516  046040
 1401  007346  047105  052107  051510
 1402  007354     000
 1403          007356                          ,EVEN
 1404  007356  042522  040514  044524  TITL2:  ,ASCIZ  /RELATIVE TIMING - /
 1405  007364  042526  052040  046511
 1406  007372  047111  020107  020075
 1407  007400     000
 1408          007402                          ,EVEN
 1409  007402  042522  040514  044524  TITL3:  ,ASCIZ  /RELATIVE TIMING TEST FOR SLEWING/
 1410  007410  042526  052040  046511
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 1411  007416  047111  020107  042524
 1412  007424  052123  043040  051117
 1413  007432  051440  042514  044527
 1414  007440  043516    000
 1415          007444                          ,EVEN
 1416  007444  040504  040524  052040  TITL4:  ,ASCIZ  /DATA TRANSFER LINES FUNCTIONAL TEST/
 1417  007452  040522  051516  042506
 1418  007460  020122  044514  042516
 1419  007466  020123  052506  041516
 1420  007474  044524  047117  046101
 1421  007502  052040  051505  000124
 1422                                          ,EVEN
 1423  007510  050123  041501  047111  TITL5:  ,ASCIZ  /SPACING, CARRIAGE RETURN, AND LINE FEED EXERCISE TEST (WITH OVERPRINT)/
 1424  007516  026107  041440  051101
 1425  007524  044522  043501  020105
 1426  007532  042522  052524  047122
 1427  007540  020054  047101  020104
 1428  007546  044514  042516  043040
 1429  007554  042505  020104  054105
 1430  007562  051105  044503  042523
 1431  007570  052040  051505  020124
 1432  007576  053450  052111  020110
 1433  007604  053117  051105  051120
 1434  007612  047111  024524    000
 1435          007620                          ,EVEN
 1436  007620  044103  051101  041501  TITL6:  ,ASCIZ  /CHARACTER GENERATION TEST - REGULAR (WITH OVERPRINT)/
 1437  007626  042524  020122  042507
 1438  007634  042516  040522  044524
 1439  007642  047117  052040  051505
 1440  007650  020124  020055  042522
 1441  007656  052507  040514  020122
 1442  007664  053450  052111  020110
 1443  007672  053117  051105  051120
 1444  007700  047111  024524    000
 1445          007706                          ,EVEN
 1446  007706  047522  040524  044524  TITL7:  ,ASCIZ  /ROTATING COUNTERCLOCKWISE PATTERN ENDURANCE TEST/
 1447  007714  043516  041440  052517
 1448  007722  052116  051105  046103
 1449  007730  041517  053513  051511
 1450  007736  020105  040520  052124
 1451  007744  051105  020116  047105
 1452  007752  052504  040522  041516
 1453  007760  020105  042524  052123
 1454  007766    000
 1455          007770                          ,EVEN
 1456  007770  042524  052123  052040  TITL8:  ,ASCIZ  /TEST THAT LOWER CASE ALPHABET CODES PRINT OUT AS UPPER CASE/
 1457  007776  040510  020124  047514
 1458  010004  042527  020122  040503
 1459  010012  042523  040440  050114
 1460  010020  040510  042502  020124
 1461  010026  047503  042504  020123
 1462  010034  051120  047111  020124
 1463  010042  052517  020124  051501
 1464  010050  052440  050120  051105
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 1465  010056  041440  051501  000105
 1466                                          ,EVEN
 1467  010064  044103  051101  041501  TITL10: ,ASCIZ  /CHARACTER GENERATION TEST - ELONGATED (WITH OVERPRINT)/
 1468  010072  042524  020122  042507
 1469  010100  042516  040522  044524
 1470  010106  047117  052040  051505
 1471  010114  020124  020055  046105
 1472  010122  047117  040507  042524
 1473  010130  020104  053450  052111
 1474  010136  020110  053117  051105
 1475  010144  051120  047111  024524
 1476  010152     000
 1477          010154                          ,EVEN
 1478  010154  047522  040524  044524  TITL11: ,ASCIZ  /ROTATING COUNTERCLOCKWISE PATTERN ENDURANCE TEST (ELONGATED)/
 1479  010162  043516  041440  052517
 1480  010170  052116  051105  046103
 1481  010176  041517  053513  051511
 1482  010204  020105  040520  052124
 1483  010212  051105  020116  047105
 1484  010220  052504  040522  041516
 1485  010226  020105  042524  052123
 1486  010234  024040  046105  047117
 1487  010242  040507  042524  024504
 1488  010250     000
 1489          010252                          ,EVEN
 1490                                          ;*****************************************************************
 1491                                          ;
 1492                                          ;ERROR MESSAGES
 1493                                          ;
 1494                                          ;*****************************************************************
 1495  010252  041520  020075     000  ERRORM: ,ASCIZ  /PC= /
 1496                                          ;
 1497                                          ;
 1498          010260                          ,EVEN
 1499  010260  042440  051122  051117  EMSG0:  ,ASCIZ  / ERROR BIT SET/
 1500  010266  041040  052111  051440
 1501  010274  052105     000
 1502          010300                          ,EVEN
 1503  010300  042040  047117  020105  EMSG1:  ,ASCIZ  / DONE BIT NOT SET/
 1504  010306  044502  020124  047516
 1505  010314  020124  042523  000124
 1506                                          ,EVEN
 1507  010322  042040  047117  020105  EMSG2:  ,ASCIZ  / DONE BIT NOT CLEAR/
 1508  010330  044502  020124  047516
 1509  010336  020124  046103  040505
 1510  010344  000122
 1511                                          ,EVEN
 1512  010346  050040  044522  052116  EMSG3:  ,ASCIZ  / PRINTER INTERRUPTED WHEN PROCESSOR ABOVE PRINTER LEVEL/
 1513  010354  051105  044440  052116
 1514  010362  051105  052522  052120
 1515  010370  042105  053440  042510
 1516  010376  020116  051120  041517
 1517  010404  051505  047523  020122
 1518  010412  041101  053117  020105
```

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1519  010420  051120  047111  042524
1520  010426  020122  042514  042526
1521  010434  000114
1522                                          ,EVEN
1523  010436  050040  044522  052116  EMSG4:  ,ASCIZ  / PRINTER DIDN'T INTERRUPT WHEN PROCESSOR BELOW PRINTER LEVEL/
1524  010444  051105  042040  042111
1525  010452  023516  020124  047111
1526  010460  042524  051122  050125
1527  010466  020124  044127  047105
1528  010474  050040  047522  042503
1529  010502  051523  051117  041040
1530  010510  046105  053517  050040
1531  010516  044522  052116  051105
1532  010524  046040  053105  046105
1533  010532     000
1534            010534                        ,EVEN
1535  010534  042040  047117  020105  EMSG5:  ,ASCIZ  / DONE BIT NEVER SET/
1536  010542  044502  020124  042516
1537  010550  042526  020122  042523
1538  010556  000124
1539                                          ,EVEN
1540  010560  051440  046105  041505  EMSG6:  ,ASCIZ  / SELECT CODE NOT RECOGNIZED/
1541  010566  020124  047503  042504
1542  010574  047040  052117  051040
1543  010602  041505  043517  044516
1544  010610  042532  000104
1545                                          ,EVEN
1546  010614  042040  051505  046105  EMSG7:  ,ASCIZ  / DESELECT CODE NOT RECOGNIZED - IF MODEL DOESN'T HAVE FEATURE-OK/
1547  010622  041505  020124  047503
1548  010630  042504  047040  052117
1549  010636  051040  041505  043517
1550  010644  044516  042532  020104
1551  010652  020055  043111  046440
1552  010660  042117  046105  042040
1553  010666  042517  047123  052047
1554  010674  044040  053101  020105
1555  010702  042506  052101  051125
1556  010710  026505  045517     000
1557            010716                        ,EVEN
1558  010716  042440  051122  051117  EMSG10: ,ASCIZ  / ERROR BIT NOT SET/
1559  010724  041040  052111  047040
1560  010732  052117  051440  052105
1561  010740     000
1562            010742                        ,EVEN
1563  010742  040440  042104  042522  EMSG11: ,ASCIZ  / ADDRESS FAILURE! - 'ADDERR' CONTAINS PC OF ERROR/
1564  010750  051523  043040  044501
1565  010756  052514  042522  020041
1566  010764  020055  040447  042104
1567  010772  051105  023522  041440
1568  011000  047117  040524  047111
1569  011006  020123  041520  047440
1570  011014  020106  051105  047522
1571  011022  000122
1572                                          ,EVEN
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1573  011024  044440  020105  044502  EMSG12: ,ASCIZ  / IE BIT NOT SET/
1574  011032  020124  047516  020124
1575  011040  042523  000124
1576                                  ,EVEN
1577  011044  044440  020105  044502  EMSG13: ,ASCIZ  / IE BIT NOT CLEAR/
1578  011052  020124  047516  020124
1579  011060  046103  040505  000122
1580                                  ,EVEN
1581  011066  044440  020105  044502  EMSG14: ,ASCIZ  / IE BIT SET - SHOULDN'T BE/
1582  011074  020124  042523  020124
1583  011102  020055  044123  052517
1584  011110  042114  023516  020124
1585  011116  042502     000
1586          011122                  ,EVEN
1587  011122  046440  042117  020105  EMSG15: ,ASCIZ  / MODE BIT (BIT0) SET - SHOULDN'T BE/
1588  011130  044502  020124  041050
1589  011136  052111  024460  051440
1590  011144  052105  026440  051440
1591  011152  047510  046125  047104
1592  011160  052047  041040  000105
1593                                  ,EVEN
1594  011166  050040  044522  052116  EMSG16: ,ASCIZ  / PRINTER DIDN'T INTERRUPT - IF NO DESELECT FEATURE-OK/
1595  011174  051105  042040  042111
1596  011202  023516  020124  047111
1597  011210  042524  051122  050125
1598  011216  020124  020055  043111
1599  011224  047040  020117  042504
1600  011232  042523  042514  052103
1601  011240  043040  040505  052524
1602  011246  042522  047455  000113
1603                                  ,EVEN
1604  011254  042040  047117  020105  EMSG17: ,ASCIZ  / DONE BIT NEVER CLEARED/
1605  011262  044502  020124  042516
1606  011270  042526  020122  046103
1607  011276  040505  042522  000104
1608                                  ,EVEN
1609  011304  050040  044522  052116  EMSG20: ,ASCIZ  / PRINTER INTERRUPTED WITH PROCESSOR BELOW PRINTER LEVEL & IE BIT CLEAR/
1610  011312  051105  044440  052116
1611  011320  051105  052522  052120
1612  011326  042105  053440  052111
1613  011334  020110  051120  041517
1614  011342  051505  047523  020122
1615  011350  042502  047514  020127
1616  011356  051120  047111  042524
1617  011364  020122  042514  042526
1618  011372  020114  020046  042511
1619  011400  041040  052111  041440
1620  011406  042514  051101     000
1621          011414                  ,EVEN
1622
1623
1624                                  ;*****************************************************************
1625                                  ;
1626                                  ;THIS SECTION WILL CHECK THAT THE DATA
```

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1627                                        ;TRANSFER LINES ARE FUNCTIONING PROPERLY
1628                                        ;*****************************************************************
1629  011414  012767  011426  174754  TST22: MOV     #DATAL,RETURN   ;SET RETURN ADDRESS FOR SCOPE
1630  011422  000401                        BR      DATAL           ;IF SELECTING THIS TEST
1631  011424  104420                  SC14: SCOPE                   ;LOOP ON SLEW TIMING CHECK?
1632  011426  000403                  DATAL: BR      .+10
1633  011430  051524  031124  000062  F:     .ASCIZ  /TST22/         ;TEST NO, TO BE PRINTED OUT
1634  011436  012701  011430                MOV     #F,R1           ;MOVE ADDRESS OF TEST NO, PRINTOUT TO R1
1635  011442  004767  174266                JSR     R7,TSTTAG       ;GO TO PRINT OUT TEST NO,
1636  011446  012701  007444                MOV     #TITL4,R1       ;MOVE TEST TITLE INTO A BUFFER
1637  011452  004767  174256                JSR     R7,TSTTAG       ;PRINT TEST TITLE
1638  011456  012767  177777  167542        MOV     #-1,CNTR        ;SET INDICATOR FOR 1ST LINE OF DATA PATH TEST
1639  011464  016767  167604  167542        MOV     COLCNT,WORK     ;NO OF CHARS, PER LINE
1640  011472  005767  167530          DATAL4: TST     CNTR            ;1ST OR 2ND LINE OF DATA PATH TEST?
1641  011476  100004                        BPL     DATAL5          ;2ND LINE!
1642  011500  112767  000100  167516        MOVB    #100,CHRGEN     ;START 1ST LINE WITH AN @ SYMBOL
1643  011506  000403                        BR      DATAL6          ;KEEP ON LOADING
1644  011510  112767  000077  167506  DATAL5: MOVB    #077,CHRGEN     ;START 2ND LINE WITH A ? SYMBOL
1645  011516  005767  167512          DATAL6: TST     WORK            ;LINE FULL?
1646  011522  001424                        BEQ     DATAPR          ;YES-PRINT IT!
1647  011524  005367  167504                DEC     WORK            ;DECREASE NO, OF CHARS,/LINE
1648  011530  116777  167470  167444        MOVB    CHRGEN,@LSDB    ;LOAD CHAR, INTO PRINTER BUFFER
1649  011536  105777  167436                TSTB    @LSCS           ;WAIT FOR LOADING
1650  011542  100375                        BPL     .-4
1651  011544  022767  000100  167452        CMP     #100,CHRGEN     ;@OR ? SYMBOL NEXT?
1652  011552  001404                        BEQ     DATAL7          ;? SYMBOL NEXT
1653  011554  112767  000100  167442        MOVB    #100, CHRGEN    ;@ SYMBOL NEXT
1654  011562  000755                        BR      DATAL6          ;GO BACK TO KEEP LOADING
1655  011564  112767  000077  167432  DATAL7: MOVB    #077,CHRGEN     ;SET NEXT CHAR, TO BE A '?'
1656  011572  000751                        BR      DATAL6          ;GO BACK TO KEEP LOADING
1657                                        ;
1658                                        ;
1659
1660
1661  011574  112777  000012  167400  DATAPR: MOVB    #12,@LSDB       ;ISSUE A LINE FEED
1662  011602  105777  167372                TSTB    @LSCS           ;DONE BIT CLEAR?
1663  011606  100002                        BPL     ERR21           ;YES
1664  011610  104002                        HLT     +2              ;NO
1665                                        ;
1666                                        ;
1667  011612  104400                        SCOPE
1668  011614  005777  167360          ERR21: TST     @LSCS           ;ERROR BIT SET?
1669  011620  100002                        BPL     LFCHK7          ;NO
1670  011622  104000                        HLT     +0              ;YES
1671                                        ;
1672                                        ;       .
1673  011624  104400                        SCOPE
1674  011626  105777  167346          LFCHK7: TSTB    @LSCS           ;PRINTER BUSY?
1675  011632  100401                        BMI     RPEAT1          ;NO
1676  011634  000767                        BR      ERR21           ;YES-WAIT FOR FLAG
1677                                        ;
1678                                        ;
1679  011636  005767  167364          RPEAT1: TST     CNTR            ;WAS 1ST OR 2ND LINE JUST PRINTED?
1680  011642  100012                        BPL     SC15            ;2ND LINE-TEST COMPLETE
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1681  011644  005267  167356                INC     CNTR            ;1ST LINE-SET UP FOR 2ND
1682  011650  016767  167420  167356        MOV     COLCNT,WORK     ;RESET LENGTH OF LINE
1683  011656  000705                        BR      DATAL4          ;GO BACK TO PRINT 2ND LINE
1684                                ;*****************************************************************
1685                                ;
1686                                ;SECTION TO PRINT A LEFT-HANDED WEDGE
1687                                ;EACH LINE OF THE WEDGE IS INITIALLY SPACED OVER WITH
1688                                ;A '/' APPEARING IN THE LAST APPROPRIATE COLUMN POSITION.
1689                                ;THEN, A LINE OF E'S IS PRINTED OVER THE SPACES (2X) UP
1690                                ;TO THE SLASH.  SPACING, OVER PRINTING, CARRIAGE RETURNING,
1691                                ;AND LINE FEEDING ARE RIGOROUSLY CHECKED
1692                                ;
1693                                ;*****************************************************************
1694  011660  012767  011672  174510 TST23:  MOV     #WEDGE,RETURN   ;SET RETURN ADDRESS FOR SCOPE
1695  011666  000401                        BR      WEDGE           ;IF SELECTING THIS TEST
1696  011670  104400                SC15:   SCOPE                   ;LOOP ON DATA LINES CHECK?
1697  011672  000403                WEDGE:  BR      .+10
1698  011674  051524  031124  000063 G:      .ASCIZ  /TST23/         ;TEST NO, TO BE PRINTED OUT
1699  011702  012701  011674                MOV     #G,R1           ;MOVE ADDRESS OF TEST NO, PRINTOUT TO R1
1700  011706  004767  174022                JSR     R7,TSTTAG       ;GO TO PRINT OUT TEST NO,
1701  011712  012701  007510                MOV     #TITL5,R1       ;MOVE TEST TITLE INTO A BUFFER
1702  011716  004767  174012                JSR     R7,TSTTAG       ;PRINT TEST TITLE
1703  011722  016767  167346  167304        MOV     COLCNT,WORK     ;SET UP 1ST LINE SPACING
1704  011730  005367  167300                DEC     WORK            ;NEED 1 LESS FOR THIS TEST
1705  011734  016767  167274  167270        MOV     WORK,WAREA      ;MOVE CURRENT SPACING INTO A WORK AREA
1706  011742  016767  167266  167274        MOV     WORK,SAVESP     ;MOVE CURRENT SPACING INTO A SAVED AREA
1707                                                                ;FOR SUBSEQUENT LINE USAGE
1708  011750  016767  167256  167256 WEDGE1: MOV     WAREA,WORK      ;MOVE NEW SPACING VALUE BACK FOR USE
1709  011756  022767  000000  167246        CMP     #0,WAREA        ;ARE WE ABOUT TO PRINT THE LAST LINE OF THE WEDGE?
1710  011764  001534                        BEQ     LASTIN          ;YES - SET UP FOR PRINTING A '/'
1711  011766  112777  000040  167206 WEDGE2: MOVB    #40,@LSDB       ;NO - MOVE A SPACE INTO PRINTER BUFFER
1712  011774  105777  167200                TSTB    @LSCS           ;WAIT FOR LOADING
1713  012000  100375                        BPL     .-4
1714  012002  005367  167226                DEC     WORK            ;INCREMENT SPACING COUNT
1715  012006  005767  167222                TST     WORK            ;DO WE HAVE NO, OF SPACES DESIRED?
1716  012012  001401                        BEQ     WEDGE3          ;YES - GO TO LOAD A '/'
1717  012014  000764                        BR      WEDGE2          ;NO - LOAD ANOTHER SPACE
1718  012016  005367  167210 WEDGE3: DEC     WAREA           ;DECREASE LINE SPACING BY 1
1719  012022  112777  000057  167152        MOVB    #057,@LSDB      ;MOVE A SLASH IN AS LAST
1720  012030  105777  167144                TSTB    @LSCS           ;CHARACTER ON A LINE
1721  012034  100375                        BPL     .-4             ;AND WAIT FOR IT TO BE LOADED
1722  012036  112777  000015  167136        MOVB    #15,@LSDB       ;ISSUE A CARRIAGE RETURN TO PRINT SPACES & '/'
1723  012044  105777  167130                TSTB    @LSCS           ;IS DONE BIT CLEAR?
1724  012050  100002                        BPL     ERR23           ;YES
1725  012052  104002                        HLT     +2              ;NO
1726                                ;
1727                                ;
1728  012054  104400                        SCOPE
1729  012056  005777  167116        ERR23:  TST     @LSCS           ;ERROR BIT SET?
1730  012062  100002                        BPL     CRCHK8          ;NO
1731  012064  104000                        HLT     +0              ;YES
1732                                ;
1733                                ;
1734  012066  104400                        SCOPE
```

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1735  012070  105777  167104          CRCHK8: TSTB    @LSCS           ;PRINTER STILL BUSY?
1736  012074  100401                          BMI     WEDGE4          ;NO-GO ON TO E'S PRINTING
1737  012076  000767                          BR      ERR23           ;YES-WAIT
1738                                  ;
1739                                  ;
1740  012100  012767  177777  167120  WEDGE4: MOV     #-1,CNTR        ;SET LINE REPEAT COUNTER
1741  012106  016767  167132  167120          MOV     SAVESP,WORK     ;SET LINE LENGTH FOR E'S
1742                                                                  ;=NO. OF SPACES JUST EXECUTED
1743  012114  112777  000105  167060  WEDGE5: MOVB    #105,@LSDB      ;LOAD AN 'E' INTO PRINTER BUFFER
1744  012122  105777  167052                  TSTB    @LSCS           ;WAIT FOR LOADING
1745  012126  100375                          BPL     .-4
1746  012130  005367  167100                  DEC     WORK            ;INCREMENT 'E' LOADING COUNT
1747  012134  005767  167074                  TST     WORK            ;DO WE HAVE NO. OF E'S DESIRED?
1748  012140  001401                          BEQ     WEDGE6          ;YES - SET UP TO PRINT THEM
1749  012142  000764                          BR      WEDGE5          ;NO - LOAD ANOTHER 'E'
1750  012144  005767  167056  WEDGE6: TST     CNTR            ;1ST TIME FOR PRINTING 'E'S?
1751  012150  001411                          BEQ     TIME2           ;NO - OVERPRINTING DONE - SET UP FOR NEXT LINE OF WEDGE
1752  012152  112777  000015  167022          MOVB    #15,@LSDB       ;YES - ISSUE A CARRIAGE RETURN
1753  012160  105777  167014  WEDG6A: TSTB    @LSCS           ;DONE BIT CLEAR?
1754  012164  100007                          BPL     ERR24           ;YES
1755  012166  104002                          HLT     +2              ;NO
1756  012170  104400                          SCOPE
1757  012172  000404                          BR      ERR24
1758  012174  112777  000012  167000  TIME2:  MOVB    #12,@LSDB       ;ISSUE A LINE FEED
1759  012202  000766                          BR      WEDG6A
1760                                  ;
1761  012204  005777  166770  ERR24: TST     @LSCS           ;ERROR BIT SET?
1762  012210  100002                          BPL     CRCHK9          ;NO
1763  012212  104000                          HLT     +0              ;YES
1764                                  ;
1765                                  ;
1766  012214  104400                          SCOPE
1767  012216  105777  166756  CRCHK9: TSTB    @LSCS           ;PRINTER STILL BUSY?
1768  012222  100401                          BMI     WEDGE7          ;NO
1769  012224  000767                          BR      ERR24           ;YES-WAIT
1770                                  ;
1771                                  ;
1772  012226  005767  166774  WEDGE7: TST     CNTR            ;1ST OR 2ND TIME FOR 'E'S PRINTING?
1773  012232  100401                          BMI     WEDGE8          ;1ST TIME - SET UP FOR 2ND TIME
1774  012234  000645                          BR      WEDGE1          ;2ND TIME-SET UP FOR NEXT WEDGE LINE
1775  012236  005267  166764  WEDGE8: INC     CNTR            ;PRINT E'S A 2ND TIME
1776  012242  016767  166776  166764          MOV     SAVESP,WORK     ;RESET NO. OF E'S WANTED
1777  012250  005367  166770                  DEC     SAVESP          ;NEW LINE LENGTH OF E'S FOR NEXT LINE OF WEDGE
1778  012254  000717                          BR      WEDGE5          ;GO BACK TO OVERPRINT E'S
1779                                  ;
1780                                  ;
1781
1782
1783  012256  112777  000057  166716  LASTIN: MOVB    #'/,@LSDB       ;LAST LINE OF WEDGE-/
1784  012264  105777  166710                  TSTB    @LSCS           ;WAIT FOR LOADING
1785  012270  100375                          BPL     .-4
1786  012272  112777  000012  166702          MOVB    #12,@LSDB       ;ISSUE A LINE FEED
1787  012300  105777  166674                  TSTB    @LSCS           ;DONE BIT CLEAR?
1788  012304  100002                          BPL     ERR25           ;YES
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1789  012306  104002                        HLT     +2              ;NO
1790                                ;
1791                                ;
1792  012310  104400                        SCOPE
1793  012312  005777  166662      ERR25:    TST     @LSCS           ;ERROR BIT SET?
1794  012316  100002                        BPL     LFCHK9          ;NO
1795  012320  104000                        HLT     +0              ;YES
1796                                ;
1797                                ;
1798  012322  104400                        SCOPE
1799  012324  105777  166650      LFCHK9:   TSTB    @LSCS           ;PRINTER STILL BUSY?
1800  012330  100405                        BMI     SC16            ;NO=PROCEED TO NEXT TEST = WEDGE DONE
1801  012332  000767                        BR      ERR25           ;YES=WAIT
1802                                ;*****************************************************************
1803                                ;SECTION TO PRINT A BLOCK PATTERN CONSISTING
1804                                ;OF A FULL LINE OF EACH OF THE 64 PRINTABLE
1805                                ;CHARACTERS,  EACH LINE IS PRINTED 2X FOR BOTH THE
1806                                ;REGULAR AND ELONGATED CHARACTER OPTIONS,
1807                                ;
1808                                ;*****************************************************************
1809  012334  012767  012346  174034 TST24:   MOV     #BP1,RETURN     ;SET RETURN ADDRESS FOR SCOPE
1810  012342  000401                        BR      BP1             ;IF SELECTING THIS TEST
1811  012344  104400                SC16:   SCOPE                   ;LOOP ON WEDGE PATTERN?
1812                                ;*****************************************************************
1813                                ;
1814                                ;REGULAR BLOCK PATTERN EXECUTED NEXT WITH OVERPRINT
1815                                ;
1816                                ;*****************************************************************
1817  012346  000403                BP1:    BR      .+10
1818  012350  051524  031124  000064 H1:     .ASCIZ  /TST24/         ;TEST NO, TO BE PRINTED OUT
1819  012356  012701  012350                MOV     #H,R1           ;MOVE ADDRESS OF TEST NO, PRINTOUT TO R1
1820  012362  004767  173346                JSR     R7,TSTTAG       ;GO TO PRINT OUT TEST NO,
1821  012366  012701  007620                MOV     #TITL6,R1       ;MOVE TEST TITLE INTO A BUFFER
1822  012372  004767  173336                JSR     R7,TSTTAG       ;PRINT TEST TITLE
1823  012376  012767  177777  166636        MOV     #-1,ELONG       ;ELONG=-1 INDICATING REGULAR CHARS,
1824  012404  012767  000040  166612        MOV     #40,CHRGEN      ;SET 1ST PRINTABLE CHAR, = SPACE
1825  012412  005067  166610                CLR     CNTR            ;CLEAR LINE REPEAT COUNTER
1826  012416  016767  166652  166606        MOV     COLCNT,WAREA    ;SET LINE LENGTH
1827  012424  016767  166602  166602        MOV     WAREA, WORK     ;PUT LINE LENGTH INTO A WORK AREA
1828  012432  012767  177600  166562 BP1CA:  MOV     #-128.,CHARS    ;SET UP NO, OF CHARS, (INCLUDES OVERPRINT)
1829  012440  005767  166576       BP1D:   TST     ELONG           ;DO WE WANT ELONGATED CHARS,?
1830  012444  100403                        BMI     BP1DA           ;NO
1831  012446  112777  000016  166526        MOVB    #16,@LSDB       ;YES = ISSUE ELONGATION CODE
1832  012454  105777  166520       BP1DA:  TSTB    @LSCS           ;WAIT FOR LOADING
1833  012460  100375                        BPL     .-4
1834  012462  116777  166536  166512        MOVB    CHRGEN,@LSDB    ;LOAD CHAR, INTO BUFFER
1835  012470  005367  166540                DEC     WORK            ;DECREASE LINE LENGTH
1836  012474  005767  166534                TST     WORK            ;IS LINE FULL?
1837  012500  001401                        BEQ     BP1E            ;YES=PRINT IT
1838  012502  000764                        BR      BP1DA           ;LOAD ANOTHER CHAR,
1839  012504  005267  166512       BP1E:   INC     CHARS           ;DECREASE NO, OF CHARS, LEFT
1840                                                                ;(INCLUDES OVERPRINT) CHARS,=2/LINE
1841  012510  005767  166506                TST     CHARS           ;HAVE WE FINISHED 1ST BLOCK PATTERN?
1842  012514  100404                        BMI     BP1EA           ;NO
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1843  012516  005767  166520                TST     ELONG           ;YES - IS ELONGATION BLOCK PATTERN NEXT?
1844  012522  100127                        BPL     SC18            ;YES-SET UP FOR ELONGATED
1845                                                                  ;BLOCK PATTERN OF EACH
1846                                                                  ;OF THE 64 PRINTABLE CHARS.
1847  012524  000457                        BR      SC17
1848  012526  022767  000001  166472  BP1EA: CMP     #1,CNTR         ;HAVE WE OVERPRINTED YET?
1849  012534  001443                        BEQ     TIMER2          ;YES - SET UP FOR NEXT LINE OF BLOCK PATTERN
1850  012536  112777  000015  166436        MOVB    #15,@LSDB       ;NO - ISSUE A CARRIAGE RETURN TO PRINT
1851  012544  105777  166430        BP1F:  TSTB    @LSCS           ;DONE BIT CLEAR?
1852  012550  100002                        BPL     ERR27           ;YES
1853  012552  104002                        HLT     +2              ;NO
1854                                  ;
1855                                  ;
1856  012554  104400                        SCOPE
1857  012556  005777  166416        ERR27: TST     @LSCS           ;ERROR BIT SET?
1858  012562  100002                        BPL     LFCK11          ;NO
1859  012564  104000                        HLT     +0              ;YES
1860                                  ;
1861                                  ;
1862  012566  104400                        SCOPE
1863  012570  105777  166404        LFCK11: TSTB   @LSCS           ;PRINTER STILL BUSY?
1864  012574  100401                        BMI     BP1G            ;NO-CONTINUE
1865  012576  000767                        BR      ERR27           ;YES-WAIT
1866                                  ;
1867                                  ;
1868  012600  005767  166422        BP1G:  TST     CNTR            ;1ST OR 2ND TIME PRINTING?
1869  012604  001401                        BEQ     BP1H            ;1ST TIME
1870  012606  000406                        BR      BP1J            ;2ND TIME-SET UP FOR NEXT LINE
1871  012610  005267  166412        BP1H:  INC     CNTR            ;2ND TIME PRINT COUNTER
1872  012614  016767  166412  166412        MOV     WAREA,WORK      ;RESET LINE LENGTH
1873  012622  000706                        BR      BP1D            ;GO BACK TO PRINT AGAIN
1874                                  ;
1875                                  ;
1876  012624  005067  166376        BP1J:  CLR     CNTR            ;RESET LINE REPEAT COUNTER
1877  012630  005267  166370                INC     CHRGEN          ;GET NEXT CHAR.
1878  012634  016767  166372  166372        MOV     WAREA,WORK      ;RESET LINE LENGTH
1879  012642  000676                        BR      BP1D            ;GO BACK TO PRINT NEXT LINE
1880
1881
1882                                  ;
1883                                  ;
1884  012644  112777  000012  166330 TIMER2: MOVB    #012,@LSDB      ;ISSUE A LINE FEED FOR 2ND PRINT
1885  012652  000734                        BR      BP1F            ;GO BACK TO WAIT FOR PRINTING
1886                                  ;
1887                                  ;
1888  012654  012767  012666  173514 TST25: MOV     #BP2,RETURN     ;SET RETURN ADDRESS FOR SCOPE
1889  012662  000401                        BR      BP2             ;IF SELECTING THIS TEST
1890  012664  104400                SC17:   SCOPE                   ;LOOP ON REGULAR BLOCK PATTERN?
1891                                  ;*****************************************************************
1892                                  ;
1893                                  ;ELONGATED BLOCK PATTERN EXECUTED NEXT WITH OVERPRINT
1894                                  ;
1895                                  ;*****************************************************************
1896  012666  112777  000012  166306 BP2:    MOVB    #12,@LSDB       ;ISSUE A LINE FEED
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 1897  012674  105777  166300                  TSTB    @LSCS           ;WAIT FOR EXECUTION
 1898  012700  100375                          BPL     .-4
 1899  012702  000403                          BR      .+10
 1900  012704  051524  031124  000065  I1:     .ASCIZ  /TST25/         ;TEST NO, TO BE PRINTED OUT
 1901  012712  012701  012704                  MOV     #I,R1           ;MOVE ADDRESS OF TEST NO, PRINTOUT TO R1
 1902  012716  004767  173012                  JSR     R7,TSTTAG       ;GO TO PRINT OUT TEST NO,
 1903  012722  012701  010064                  MOV     #TITL10,R1      ;MOVE TEST TITLE INTO A BUFFER
 1904  012726  004767  173002                  JSR     R7,TSTTAG       ;GO TO PRINT IT
 1905  012732  005267  166304                  INC     ELONG           ;ELONG=0 INDICATING ELONGATION
 1906  012736  016767  166332  166266          MOV     COLCNT,WAREA    ;RESET NEW LINE LENGTH
 1907  012744  006267  166262                  ASR     WAREA           ;NEED HALVE THE VALUE FOR THIS TEST
 1908  012750  005067  166252                  CLR     CNTR            ;CLEAR LINE REPEAT COUNTER
 1909  012754  012767  000040  166242          MOV     #40,CHRGEN      ;SET 1ST PRINTABLE CHAR, = SPACE
 1910  012762  016767  166244  166244          MOV     WAREA,WORK      ;PUT LINE LENGTH INTO A WORK AREA
 1911  012770  000620                          BR      BP1CA           ;GO BACK TO EXECUTE ELONGATED BLOCK PATTERN
 1912                                  ;*****************************************************************
 1913                                  ;
 1914                                  ;SECTION TO PRINT A COUNTER CLOCKWISE ROTATING PATTERN
 1915                                  ;THIS TEST IS DESIGNED TO PICK UP SPURIOUS PRINTING
 1916                                  ;AND CHECK PRINTER ENDURANCE
 1917                                  ;
 1918                                  ;*****************************************************************
 1919  012772  012767  013004  173376  TST26:  MOV     #ROTOR,RETURN   ;SET RETURN ADDRESS FOR SCOPE
 1920  013000  000401                          BR      ROTOR           ;IF SELECTING THIS TEST
 1921  013002  104400                  SCI8:   SCOPE                   ;LOOP ON ELONGATED BLOCK PATTERN?
 1922                                  ;*****************************************************************
 1923                                  ;
 1924                                  ;REGULAR ROTATING PATTERN EXECUTED NEXT
 1925                                  ;
 1926                                  ;*****************************************************************
 1927  013004  112777  000012  166170  ROTOR1:  MOVB    #12,@LSDB       ;ISSUE A LINE FEED
 1928  013012  105777  166162                  TSTB    @LSCS           ;WAIT FOR EXECUTION
 1929  013016  100375                          BPL     .-4
 1930  013020  000403                          BR      .+10
 1931  013022  051524  031124  000066  J1:     .ASCIZ  /TST26/         ;TEST NO, TO BE PRINTED OUT
 1932  013030  012701  013022                  MOV     #J,R1           ;MOVE ADDRESS OF TEST NO, PRINTOUT TO R1
 1933  013034  004767  172674                  JSR     R7,TSTTAG       ;GO TO PRINT OUT TEST NO,
 1934  013040  012701  007706                  MOV     #TITL7,R1       ;MOVE TEST TITLE INTO A BUFFER
 1935  013044  004767  172664                  JSR     R7,TSTTAG       ;PRINT TEST TITLE
 1936  013050  012767  000140  166166          MOV     #140,SAVESP     ;LINE STANDOFF
 1937  013056  005067  166166                  CLR     CHARNO          ;CLEAR SECONDARY PRINTABLE CHARS, LENGTH
 1938  013062  012767  177777  166152          MOV     #-1,ELONG       ;ELONG=-1 INDICATING REGULAR
 1939  013070  012767  177677  166150          MOV     #-65.,LINCNT    ;CHARACTER PRINT
 1940  013076  012767  000040  166120          MOV     #40,CHRGEN      ;SET 1ST PRINTABLE CHAR, = SPACE
 1941  013104  016767  166164  166120          MOV     COLCNT,WAREA    ;SET UP LINE LENGTH
 1942  013112  016767  166114  166114          MOV     WAREA,WORK      ;MOVE LINE LENGTH INTO A WORK AREA
 1943  013120  012767  177700  166074          MOV     #-64.,CHARS     ;SET UP NO, OF PRINTABLE CHARS,
 1944  013126  005767  166110          ROTR3A: TST     ELONG           ;REGULAR OR ELONGATED PATTERN?
 1945  013132  100406                          BMI     ROTOR5          ;REGULAR
 1946  013134  112777  000016  166040          MOVB    #16,@LSDB       ;ELONGATED - ISSUE ELONGATION CODE
 1947  013142  105777  166032                  TSTB    @LSCS           ;WAIT FOR LOADING!
 1948  013146  100375                          BPL     .-4
 1949  013150  116777  166050  166024  ROTOR5: MOVB    CHRGEN,@LSDB    ;LOAD CHAR, INTO BUFFER
 1950  013156  105777  166016                  TSTB    @LSCS           ;WAIT FOR EXECUTION
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 1951  013162  100375                          BPL     .-4
 1952  013164  022767  000001  166042          CMP     #1,WORK         ;END OF LINE?
 1953  013172  001424                          BEQ     ROTOR7          ;YES - GO TO PRINT IT
 1954  013174  022767  177777  166020          CMP     #-1,CHARS       ;NO-START CHARS, OVER?
 1955  013202  001407                          BEQ     ROTOR6          ;YES
 1956  013204  005367  166024                  DEC     WORK            ;NO-DECREASE LINE BY 1 CHAR,
 1957  013210  005267  166006                  INC     CHARS           ;DECREASE NO, OF AVAILABLE
 1958                                                                  ;CHARACTERS BY 1
 1959  013214  005267  166004                  INC     CHRGEN          ;GET NEXT AVAILABLE CHAR,
 1960  013220  000753                          BR      ROTOR5          ;GO BACK TO LOAD
 1961                                  ;
 1962                                  ;
 1963  013222  012767  177700  165772  ROTOR6: MOV     #-64.,CHARS     ;RESET NO, OF PRINTABLE CHARS,
 1964  013230  012767  000040  165766          MOV     #40,CHRGEN      ;START WITH SPACE AGAIN
 1965  013236  005367  165772                  DEC     WORK            ;DECREASE LINE LENGTH
 1966  013242  000731                          BR      ROTR3A          ;GO BACK TO KEEP LOADING
 1967                                  ;
 1968                                  ;
 1969  013244  112777  000012  165730  ROTOR7: MOVB    #12,@LSDB       ;ISSUE A LINE FEED TO PRINT
 1970  013252  105777  165722                  TSTB    @LSCS           ;DONE BIT CLEAR
 1971  013256  100002                          BPL     ERR29           ;YES
 1972  013260  104002                          HLT     +2              ;NO
 1973                                  ;
 1974                                  ;
 1975  013262  104400                          SCOPE
 1976  013264  005777  165710          ERR29:  TST     @LSCS           ;ERROR BIT SET?
 1977  013270  100002                          BPL     LFCK13          ;NO
 1978  013272  104000                          HLT     +0              ;YES
 1979                                  ;
 1980                                  ;
 1981  013274  104400                          SCOPE
 1982  013276  105777  165676          LFCK13: TSTB    @LSCS           ;PRINTER STILL BUSY?
 1983  013302  100401                          BMI     ROTOR8          ;NO
 1984  013304  000767                          BR      ERR29           ;YES-WAIT
 1985                                  ;
 1986                                  ;
 1987  013306  005267  165734          ROTOR8: INC     LINCNT          ;INCREASE LINE COUNT
 1988  013312  005767  165730                  TST     LINCNT          ;DONE REGULAR PATTERN?
 1989  013316  100404                          BMI     ROTR8A          ;NO
 1990  013320  005767  165716                  TST     ELONG           ;YES - IS ELONGATION PATTERN DONE?
 1991  013324  100076                          BPL     SC20            ;YES - PROCEED TO NEXT TEST
 1992  013326  000423                          BR      SC19            ;NO-SET UP FOR ELONGATION!
 1993  013330  005367  165710          ROTR8A: DEC     SAVESP          ;NO-GO ON WITH REGULAR PATTERN
 1994                                                                  ;AND SET STANDOFF FOR NEXT LINE
 1995  013334  016767  165704  165662          MOV     SAVESP,CHRGEN   ;SET STARTING CHAR, OF NEXT LINE
 1996  013342  016767  165664  165664          MOV     WAREA,WORK      ;RESET LINE LENGTH
 1997  013350  062767  177777  165672          ADD     #-1,CHARNO      ;RESET SECONDARY PRINTABLE CHAR, LENGTH
 1998  013356  016767  165666  165636          MOV     CHARNO,CHARS    ;INSERT NEW SECONDARY LENGTH
 1999                                                                  ;INTO NO, OF AVAILABLE CHARS,
 2000  013364  000660                          BR      ROTR3A          ;GO BACK TO FILL ANOTHER LINE
 2001
 2002
 2003                                  ;
 2004                                  ;
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2005  013366  012767  013400  173002  TST27:  MOV     #ROTOR9,RETURN  ;SET RETURN ADDRESS FOR SCOPE
2006  013374  000401                          BR      ROTOR9          ;IF SELECTING THIS TEST
2007  013376  104400                  SC19:   SCOPE                   ;LOOP ON REGULAR ROTATING PATTERN?
2008                                          ;*************************************************************
2009                                          ;
2010                                          ;ELONGATED ROTATING PATTERN EXECUTED NEXT
2011                                          ;
2012                                          ;*************************************************************
2013  013400  000403                  ROTOR9: BR      .+10
2014  013402  051524  031124  000067  K:      .ASCIZ  /TST27/         ;TEST NO, TO BE PRINTED OUT
2015  013410  012701  013402                  MOV     #K,R1           ;MOVE ADDRESS OF TEST NO, PRINTOUT TO R1
2016  013414  004767  172314                  JSR     R7,TSTTAG       ;GO TO PRINT OUT TEST NO,
2017  013420  012701  010154                  MOV     #TITL11,R1      ;MOVE TEST TITLE INTO A BUFFER
2018  013424  004767  172304                  JSR     R7,TSTTAG       ;GO TO PRINT IT
2019  013430  005267  165606                  INC     ELONG           ;ELONG=1 INDICATING ELONGATION
2020  013434  016767  165634  165570          MOV     COLCNT,WAREA    ;SET A NEW LINE LENGTH
2021  013442  006267  165564                  ASR     WAREA           ;NEED HALVE THE VALUE FOR THIS TEST
2022  013446  016767  165560  165560          MOV     WAREA,WORK      ;PUT NEW LINE LENGTH INTO A WORK AREA
2023  013454  012767  177677  165564          MOV     #-65.,LINCNT    ;RESET THE LINE COUNT
2024  013462  012767  000140  165554          MOV     #140,SAVESP     ;RESET LINE STANDOFF
2025  013470  012767  177700  165524          MOV     #-64.,CHARS     ;RESET NO, OF AVAILABLE CHARS
2026  013476  005067  165546                  CLR     CHARNO          ;CLEAR SECONDARY PRINTABLE CHARS, LENGTH
2027  013502  012767  000040  165514          MOV     #40,CHRGEN      ;SET 1ST PRINTABLE CHAR, = SPACE
2028  013510  000606                          BR      ROTR3A          ;GO BACK TO EXECUTE ELONGATED ROTATING PATTERN
2029                                          ;*************************************************************
2030                                          ;
2031                                          ;SECTION TO TEST THAT LOWER CASE ALPHABET CODES
2032                                          ;ARE FORCED TO UPPER CASE EQUIVALENTS WHEN PRINTED
2033                                          ;
2034                                          ;*************************************************************
2035  013512  012767  013524  172656  TST30:  MOV     #UCASE,RETURN   ;SET RETURN ADDRESS FOR SCOPE
2036  013520  000401                          BR      UCASE           ;IF SELECTING THIS TEST
2037  013522  104400                  SC20:   SCOPE                   ;LOOP ON ELONGATED ROTATING PATTERN?
2038  013524  005067  165476          UCASE:  CLR     CNTR            ;CLEAR COUNTER
2039  013530  000403                          BR      .+10
2040  013532  051524  031524  000060  L:      .ASCIZ  /TST30/         ;TEST NO, TO BE PRINTED OUT
2041  013540  012701  013532                  MOV     #L,R1           ;MOVE ADDRESS OF TEST NO, PRINTOUT TO R1
2042  013544  004767  172164                  JSR     R7,TSTTAG       ;GO TO PRINT OUT TEST NO,
2043  013550  012767  000064  165454          MOV     #64,WAREA       ;SET 1ST LINE LENGTH FOR PRINTING
2044                                                                  ;ALPHABET (NORMAL SIZE)
2045  013556  012701  007770                  MOV     #TITL8,R1       ;MOVE TEST TITLE INTO A BUFFER
2046  013562  004767  172146                  JSR     R7,TSTTAG       ;PRINT TEST TITLE
2047  013566  012767  000101  165430          MOV     #101,CHRGEN     ;SET 1ST CHAR, = 1ST LETTER OF ALPHABET
2048  013574  016767  165432  165432          MOV     WAREA,WORK      ;MOVE LINE LENGTH TO A WORK AREA
2049  013602  116777  165416  165372  UCASE4: MOVB    CHRGEN,@LSDB    ;MOVE CHAR, INTO PRINTER BUFFER
2050  013610  105777  165364                  TSTB    @LSCS           ;WAIT FOR EXECUTION
2051  013614  100375                          BPL     .-4
2052  013616  112777  000040  165356  UCASE5: MOVB    #40,@LSDB       ;MOVE A SPACE INTO PRINTER BUFFER
2053  013624  105777  165350                  TSTB    @LSCS           ;WAIT FOR LOADING
2054  013630  100375                          BPL     .-4
2055  013632  162767  000002  165374          SUB     #2,WORK         ;DECREASE LINE LENGTH BY 2
2056  013640  005767  165370                  TST     WORK            ;IS LINE READY TO BE PRINTED?
2057  013644  001403                          BEQ     UCASE6          ;YES
2058  013646  005267  165352                  INC     CHRGEN          ;NO - GET NEXT LETTER OF ALPHABET
```

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2059  013652  000753                          BR      UCASE4          ;GO TO LOAD IT INTO BUFFER
2060  013654  112777  000012  165320  UCASE6: MOVB    #12,@LSDB       ;ISSUE A LINE FEED TO PRINT LINE
2061
2062  013662  105777  165312                  TSTB    @LSCS           ;DONE BIT CLEAR?
2063  013666  100002                          BPL     ERR32           ;YES
2064  013670  104002                          HLT     +2              ;NO
2065                                  ;
2066                                  ;
2067  013672  104400                          SCOPE
2068  013674  005777  165300          ERR32:  TST     @LSCS           ;DID ANY ERROR OCCUR?
2069  013700  100002                          BPL     LFCK16          ;NO
2070  013702  104000                          HLT     +0              ;YES
2071                                  ;
2072                                  ;
2073  013704  104400                          SCOPE
2074  013706  105777  165266          LFCK16: TSTB    @LSCS           ;IS PRINTER STILL BUSY?
2075  013712  100401                          BMI     UCASE7          ;NO - PROCEED TESTING
2076  013714  000767                          BR      ERR32           ;YES - WAIT
2077                                  ;
2078                                  ;
2079  013716  005767  165304          UCASE7: TST     CNTR            ;WAS 1ST OR 2ND LINE JUST PRINTED?
2080  013722  100001                          BPL     UCASE8          ;1ST - SET UP FOR 2ND
2081  013724  000420                          BR      SC21            ;2ND - TEST DONE - PROCEED
2082                                  ;
2083                                  ;
2084  013726  012767  000066  165276  UCASE8: MOV     #66,WAREA       ;SET 2ND LINE LENGTH FOR PRINTING
2085                                                                  ;LOWER-CASE ALPHABET WHICH SHOULD
2086                                                                  ;PRINT OUT AS UPPER CASE
2087  013734  005367  165266                  DEC     CNTR            ;DECREMENT COUNTER
2088  013740  012767  000140  165256          MOV     #140,CHRGEN     ;SET 1ST CHAR. = LOWER-CASE 'A'
2089  013746  016767  165260  165260          MOV     WAREA,WORK      ;MOVE LINE LENGTH TO A WORK AREA
2090  013754  000720                          BR      UCASE5          ;GO BACK TO START 2ND LINE WITH A SPACE
2091                                  ;
2092                                  ;
2093  013756  012767  013774  172412  TST31:  MOV     #OPPRT0,RETURN  ;SET RETURN ADDRESS FOR SCOPE
2094  013764  000403                          BR      OPPRT0          ;IF SELECTING THIS TEST
2095  013766  104400                  SC21:   SCOPE                   ;LOOP ON LOWER-CASE ALPHABET TEST?
2096  013770  000167  000232                  JMP     END             ;GO TO END OF PROGRAM!
2097                                  ;*****************************************************************
2098                                  ;
2099                                  ;TEST 31 IS A COMBINATION OF 2 ROUTINES - - - -
2100                                  ;
2101                                  ;ROUTINE (OPTIONAL) TO PROVIDE A "PRINT TIME FREE" CHARACTER PULSE
2102                                  ;GENERATION FOR MAINTENANCE PURPOSES.  THIS ROUTINE CAN ONLY BE
2103                                  ;ACCESSED BY SETTING BIT09 TO A 1 AND SELECTING TEST 31.  BIT12
2104                                  ;MUST ALSO BE SET.  WHEN THESE CONDITIONS ARE MET A "PRINT TIME
2105                                  ;FREE" PULSE STRING IS PROVIDED BY SELECTING THE CHARACTER WANTED
2106                                  ;IN THE SWITCH REGISTER.  THE SECTION OF CODE WILL HANDLE THE REST.
2107                                  ;A PARTICULAR PULSE STRING IS PROVIDED UNTIL THE TEST IS HALTED
2108                                  ;BY THE USER OR UNTIL ANOTHER DIFFERENT CHARACTER IS INSERTED IN
2109                                  ;THE SWITCH REGISTER.
2110                                  ;
2111                                  ;ROUTINE (OPTIONAL) TO INPUT A LINE OF SOME PRINTABLE CHARACTER
2112                                  ;ONTO THE CENTRONICS PRINTER INDEFINATELY UNTIL HALTED BY THE
```

```
2113                                    ;USER,  THIS ROUTINE CAN ONLY BE ACCESSED BY SETTING BIT09 TO A 1
2114                                    ;AND SELECTING TEST 31,  BIT10 SET INDICATES TO PRINT LINES
2115                                    ;OF THE SPECIFIED CHARACTER ELONGATED,  A CHAR, WILL BE PRINTED OUT
2116                                    ;UNTIL THE TEST IS HALTED BY THE USER OR UNTIL ANOTHER DIFFERENT
2117                                    ;CHARACTER IS INSERTED INTO THE SWITCH REGISTER,
2118                                    ;
2119                                    ;*****************************************************************
2120  013774  000004                   OPPRT0: TYPE                    ;PRINT OUT MESSAGE
2121  013776  007206                           MES7                    ;TELLING USER TO INSERT A CHARACTER
2122  014000  000004                           TYPE                    ;PRINT OUT "HIT CONTINUE SWITCH TO
2123  014002  007002                           MES3                    ;RESUME OPERATION"
2124  014004  000000                           HALT
2125  014006  036727  163556  010000  NOMSGS: BIT     SWR,#10000      ;DO WE WANT PULSE GENERATION?
2126  014014  001067                           BNE     OPPRT6          ;YES WE DO
2127  014016  036727  163546  002000           BIT     SWR,#2000       ;NO - WE WANT LINES OF A CHARACTER PRINTOUT
2128                                                                   ;REGULAR OR ELONGATED?
2129  014024  001412                           BEQ     OPPRT1          ;REGULAR
2130  014026  012767  177676  165200           MOV     #-66.,,WORK     ;ELONGATED
2131  014034  112777  000016  165140           MOVB    #16,@LSDB       ;ISSUE ELONGATION CODE
2132  014042  105777  165132                   TSTB    @LSCS           ;WAIT FOR LOADING
2133  014046  100375                           BPL     .-4
2134  014050  000403                           BR      OPPRT2          ;START LOADING THE LINE
2135  014052  012767  177574  165154  OPPRT1: MOV     #-132.,,WORK    ;SET UP FOR A FULL LINE OF THE CHARACTER
2136  014060  122767  000023  163502  OPPRT2: CMPB    #23,SWR         ;HAVE WE GIVEN A DESELECT CODE?
2137  014066  001401                           BEQ     OPPRT3          ;YES - DON'T PROCEED TILL SELECT CODE GIVEN
2138  014070  000404                           BR      OPPRT4          ;NO - PROCEED
2139  014072  122767  000021  163470  OPPRT3: CMPB    #21,SWR         ;HAS SELECT CODE BEEN ISSUED YET?
2140  014100  001374                           BNE     OPPRT3          ;NO - DON'T GO ON TILL IT HAS!
2141  014102  116777  163462  165072  OPPRT4: MOVB    SWR,@LSDB       ;YES - GET THE CHARACTER
2142  014110  105777  165064                   TSTB    @LSCS           ;WAIT FOR LOADING
2143  014114  100375                           BPL     .-4
2144  014116  005267  165112                   INC     WORK            ;INCREASE CHARACTER COUNT
2145  014122  005767  165106                   TST     WORK            ;FULL LINE YET?
2146  014126  001401                           BEQ     OPPRT5          ;YES - PRINT IT
2147  014130  000753                           BR      OPPRT2          ;NO - GET ANOTHER CHARACTER
2148  014132  112777  000012  165042  OPPRT5: MOVB    #12,@LSDB       ;PRINT THE LINE OF THE CHARACTER WANTED
2149  014140  105777  165034                   TSTB    @LSCS           ;DONE BIT CLEAR?
2150  014144  100002                           BPL     ERR30           ;YES - CHECK FOR ANY ERROR
2151  014146  104002                           HLT     +2              ;NO
2152                                    ;
2153                                    ;
2154  014150  104400                           SCOPE
2155  014152  005777  165022           ERR30:  TST     @LSCS           ;ERROR BIT SET?
2156  014156  100002                           BPL     LFCK14          ;NO
2157  014160  104000                           HLT     +0              ;YES
2158                                    ;
2159                                    ;
2160  014162  104400                           SCOPE
2161  014164  105777  165010           LFCK14: TSTB    @LSCS           ;PRINTER STILL BUSY?
2162  014170  100706                           BMI     NOMSGS          ;NO -  SET UP TO PRINT  ANOTHER LINE
2163  014172  000767                           BR      ERR30           ;YES - WAIT
2164                                    ;
2165                                    ;
2166  014174  116777  163370  165000  OPPRT6: MOVB    SWR,@LSDB       ;MOVE CHAR, INTO PRINTER BUFFER
```

```
2167  014202  105777  164772          TSTB    @LSCS           ;WAIT FOR LOADING
2168  014206  100375                  BPL     .-4
2169  014210  112777  000177  164764  MOVB    #177,@LSDB      ;FOLLOWED BY A DELETE CODE
2170                                                          ;TO KILL PRINT TIME
2171  014216  105777  164756          TSTB    @LSCS           ;WAIT FOR LOADING
2172  014222  100375                  BPL     .-4
2173  014224  000670                  BR      NOMSGS          ;GO BACK TO SEE IF CHAR. CHANGED OR IF
2174                                                          ;BIT12 HAS BEEN CLEARED INDICATING WE
2175                                                          ;NOW WANT TO PRINT LINES OF CHARS.
2176                                  ;
2177                                  ;
2178  014226  005267  165022  END:   INC     PCNT            ;INCREMENT THE PASS COUNT
2179  014232  113777  001276  164746          MOVB    @#RING,@TPB     ;RING THE BELL OR PRINT A CHARACTER
2180  014240  105777  164744          TSTB    @TPS
2181  014244  100375                  BPL     .-4
2182  014246  013700  000042          MOV     @#42,R0         ;MOVE CONTENTS OF LOC. 42 TO R0
2183  014252  001404                  BEQ     DONE            ;JUMP TO PROGRAM RESTART
2184  014254  004710                  JSR     R7,(R0)         ;RETURN TO MONITOR - NOT PAPER TAPE LOADED
2185  014256  000240                  NOP
2186  014260  000240                  NOP
2187  014262  000240                  NOP
2188  014264  000167  165344  DONE:   JMP     RSTART          ;JUMP TO RESTART OF PROGRAM
2189          000000                  X=0
2190  014270                  TABLE:                          ;TABLE OF TEST ADDRESSES
2191                                                          ;(USED WHEN SW<09> SET TO A 1)
2192  014270  001346                  TST0
2193  014272  001700                  TST1
2194  014274  001754                  TST2
2195  014276  002126                  TST3
2196  014300  002254                  TST4
2197  014302  002556                  TST5
2198  014304  002670                  TST6
2199  014306  003070                  TST7
2200  014310  003174                  TST10
2201  014312  003346                  TST11
2202  014314  003612                  TST12
2203  014316  004002                  TST13
2204  014320  004172                  TST14
2205  014322  004432                  TST15
2206  014324  005116                  TST16
2207  014326  005200                  TST17
2208  014330  005262                  TST20
2209  014332  005344                  TST21
2210  014334  011414                  TST22
2211  014336  011660                  TST23
2212  014340  012334                  TST24
2213  014342  012654                  TST25
2214  014344  012772                  TST26
2215  014346  013366                  TST27
2216  014350  013512                  TST30
2217  014352  013756                  TST31
2218                                  ;
2219                                  ;
2220          000000                  X=0
```

```
 2221  014354                          MSGTAB!                         ;TABLE OF ERROR MESSAGE ADDRESSES
 2222                                                                  ;(USED WHEN HLT EXECUTED)
 2223  014354  010260                                  EMSG0
 2224  014356  010300                                  EMSG1
 2225  014360  010322                                  EMSG2
 2226  014362  010346                                  EMSG3
 2227  014364  010436                                  EMSG4
 2228  014366  010534                                  EMSG5
 2229  014370  010560                                  EMSG6
 2230  014372  010614                                  EMSG7
 2231  014374  010716                                  EMSG10
 2232  014376  010742                                  EMSG11
 2233  014400  011024                                  EMSG12
 2234  014402  011044                                  EMSG13
 2235  014404  011066                                  EMSG14
 2236  014406  011122                                  EMSG15
 2237  014410  011166                                  EMSG16
 2238  014412  011254                                  EMSG17
 2239  014414  011304                                  EMSG20
 2240
 2241          000001                                  .END
```

```
A          004536          899#    900
ADDERR     001270           68#   1268*
ADTENP     005726         1098    1121#
AGAIN      004452          873#    893
ALMOST     006140         1190    1195#
B          005132          989#    990
BDCNVA     005630         1100#   1103
BEGIN      001300           10     134#
BELL       004204          779     780     982#
BELLT      004236          792     797#
BELL1      004246          798     802#
BELL2      004310          816     820#
BP1        012346         1809    1810    1817#
BP1CA      012432         1828#   1911
BP1D       012440         1829#   1873    1879
BP1DA      012454         1830    1832#   1838
BP1E       012504         1837    1839#
BP1EA      012526         1842    1848#
BP1F       012544         1851#   1885
BP1G       012600         1864    1868#
BP1H       012610         1869    1871#
BP1J       012624         1870    1876#
BP2        012666         1888    1889    1896#
BUSERR =   000004           83#    232*    241*
C          005214         1006#   1007
CARRET     003102          507     508     515#   1232
CHARNO     001250           56#   1937*   1997*   1998    2026*
CHARS      001222           45#    906*    914     916*    919*   1828*   1839*   1841    1943*   1954    1957*   1963*   1998*
                          2025*
CHRGEN     001224           46#    907*    908     917*    920*   1642*   1644*   1648    1651    1653*   1655*   1824*   1834
                         1877*   1909*   1940*   1949    1959*   1964*   1995*   2027*   2047*   2049    2058*   2088*
CH100      005130          905     985     986     988#
CH132      004444          869     870     872#
CH132A     004524          892     896#
CH132F     004612          908#    918     921
CH40       005274         1012    1019    1020    1022#
CH80       005212          995    1002    1003    1005#
CLRIE      002524          397#    407
CNTR       001226           47#   1638*   1640    1679    1681*   1740*   1750    1772    1775*   1825*   1848    1868    1871*
                         1876*   1908*   2038*   2079    2087*
CNVCTR     005720         1099*   1102*   1118#
COLCNT     001274           71#    904     994    1011    1028    1639    1682    1703    1826    1906    1941    2020
CONT       005540         1069    1072#
CRCHK      003336          569     572     578#
CRCHK1     003602          651     659#
CRCHK2     003756          703     708#
CRCHK3     004146          760     765#
CRCHK4     004422          840     845#
CRCHK6     005052          962     967#
CRCHK7     005576         1081    1086#
CRCHK8     012070         1730    1735#
CRCHK9     012216         1762    1767#
CTST       004762          944#    949
CTST1      005002          945     950#
```

```
CYCLE    001240            52#    925*    929*    930    1064*   1162*   1166*   1167
CYCLE1   006052          1166#   1173
CYCNT    004722           929#    936
D        005276          1023#   1024
DATAL    011426          1629    1630    1632#
DATAL4   011472          1640#   1683
DATAL5   011510          1641    1644#
DATAL6   011516          1643    1645#   1654    1656
DATAL7   011564          1652    1655#
DATAPR   011574          1646    1661#
DECPC    006500          1280    1287#
DELAY    001266            67#    138*    160*    180*    283*    292*    476*   1187
DELCHK   003474           617     620     628#
DELETE   003360           586     587     589#
DESEL1   001454           163     166#
DIGIT    005722          1105*   1108*   1111*   1112    1119#
DLETE    003414           605#    624
DLETE1   003504           629     633#
DONE     014264          2183    2188#
E        005360          1042#   1043
ELONG    001242            53#   1823*   1829    1843    1905*   1938*   1944    1990*   2019*
EMSG0    010260          1499#   2223
EMSG1    010300          1503#   2224
EMSG10   010716          1558#   2231
EMSG11   010742          1563#   2232
EMSG12   011024          1573#   2233
EMSG13   011044          1577#   2234
EMSG14   011066          1581#   2235
EMSG15   011122          1587#   2236
EMSG16   011166          1594#   2237
EMSG17   011254          1604#   2238
EMSG2    010322          1507#   2225
EMSG20   011304          1609#   2239
EMSG3    010346          1512#   2226
EMSG4    010436          1523#   2227
EMSG5    010534          1535#   2228
EMSG6    010560          1540#   2229
EMSG7    010614          1546#   2230
END      014226          2096    2178#
ERBITS   003652           673     678#    686
ERBIT2   002014           263     270#
ERBIT3   003152           523     527#    536
ERBIT4   003226           547     551#    576
ERBIT5   003312           564     568#    580
ERBIT6   003400           591     598#    625
ERBIT7   003450           611     616#    630
ERBIT8   003570           645     650#    661
ERBIT9   003744           697     702#    710
ERRA     001732           232     238#
ERRIND   001264            64#    145*    219*   1230    1253*   1267*
ERROR    006412            18    1267#
ERRORM   010252          1277    1495#
ERROR1   006600          1311#   1329
ERR10    004042           730     735#    743
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ERR11     004134            754     759#    767
ERR12     004224            784     791#    799
ERR12A    004266            804     809#    817
ERR13     004410            834     839#    847
ERR14     004472            875     880#    888
ERR18     005040            956     961#    969
ERR19     005564           1075    1080#   1088
ERR20     006010           1140    1145#   1153
ERR21     011614           1663    1668#   1676
ERR23     012056           1724    1729#   1737
ERR24     012204           1754    1757    1761#   1769
ERR25     012312           1788    1793#   1801
ERR27     012556           1852    1857#   1865
ERR29     013264           1971    1976#   1984
ERR30     014152           2150    2155#   2163
ERR32     013674           2063    2068#   2076
F         011430           1633#   1634
FFCHK     004054            736     741#
FFEED     004014            724     725     727#
FFEED1    004022            728#    772
FFEED2    004064            742     746#
FINI      006136           1192    1194#
G         011674           1698#   1699
H         012350           1818#   1819
HLT     = 104000             80#    154     164     169     184     193     202     206     238     258     264     272     278
                            287     296     311     318     326     333     351     360     405     416     435     447     459
                            473     480     524     529     548     553     565     570     592     600     612     618     646
                            652     674     680     698     704     731     737     753     761     785     793     805     811
                            835     841     876     882     937     957     963    1076    1082    1141    1147    1174    1195
                           1664    1670    1725    1731    1755    1763    1789    1795    1853    1859    1972    1978    2064
                           2070    2151    2157
HLTADD    006726           1321*   1322*   1323    1336#
I         012704           1900#   1901
ICNT      001256             60#   1235*   1237    1238    1240*   1254*
ICOUNT    001262             62#    144*    218*   1228
IEBIT     002140            304     305     307#
IEBIT1    002236            322     330#
IECHK     002502            365     370     375     380     393#
IECHK1    002664            448#    490
IECHK2    003012            474#    499
IENAB     002266            343     344     346#
IENAB1    002316            350     358#
IENAB2    002330            359     364#
IENAB3    002570            428     429     431#
IENAB4    002616            434     439#
IENAB5    002676            449     455     456#
IENAB6    002716            458     461#
IENOGO    002436            369     374     379     383#
INCR1     006114           1188#   1193
INTLVL    001216             37#    368     373     378
INTVEC    002534            347     405#
INVEC     002542            384     416#
INVEC1    003044            431     488#
INVEC2    003056            464     497#
```

```
J       013022          1931#   1932
K       013402          2014#   2015
L       013532          2040#   2041
LASTIN  012256          1710    1783#
LFCHK   003326           552     555    574#
LFCHK1  003464           599     602    623#
LFCHK2  004300           810     815#
LFCHK3  004504           881     886#
LFCHK7  011626          1669    1674#
LFCHK9  012324          1794    1799#
LFCK11  012570          1858    1863#
LFCK13  013276          1977    1982#
LFCK14  014164          2156    2161#
LFCK16  013706          2069    2074#
LFEED   003206           542     543    545#
LFEED1  003242           556#    575
LFNO    001220            44#    872-   891-
LFRATE  005356          1038    1039   1041#
LFRAT1  005402          1046#   1051
LFRAT2  005422          1047    1052#
LINCNT  001246            55#   1939-  1987-  1988   2023-
LSCS    001200            30#    152    162    167    182    191    200    204    234-   256    262    270    276
                          285    294    308-   309    315-   316    323-   324    331    349    358    393-   397-
                          433    440-   446-   457    467-   472-   478    488-   497-   516    519    522    527
                          532    546    551    557    560    563    568    574    578    590    598    607    610
                          616    623    628    634    637    641    644    650    659    672    678    684    690
                          693    696    702    708    729    935    941    747    758    753    759    765    783
                          791    797    803    809    815    821    824    827    838    833    839    845    874
                          880    886    909    927    933    935    947    955    961    967   1049   1053   1061
                         1066   1074   1080   1086   1113   1130   1135   1139   1145   1151   1164   1170   1172
                         1191   1649   1662   1668   1674   1712   1920   1723   1729   1735   1744   1753   1761
                         1767   1784   1787   1793   1799   1832   1851   1857   1863   1897   1928   1947   1950
                         1970   1976   1982   2058   2053   2062   2068   2074   2132   2142   2149   2155   2161
                         2167   2171
LSDB    001202            31#    136-   151-   159-   166-   179-   236-   282-   291-   456-   475-   515-   518-
                          521-   545-   556-   559-   562-   589-   605-   609-   633-   636-   639-   643-   671-
                          689-   692-   695-   728-   746-   749-   752-   782-   802-   820-   823-   826-   829-
                          832-   873-   908-   924-   946-   954-  1048-  1052-  1055-  1057-  1060-  1070-  1073-
                         1112-  1129-  1134-  1138-  1648-  1661-  1711-  1719-  1722-  1743-  1752-  1758-  1783-
                         1786-  1831-  1834-  1850-  1884-  1896-  1927-  1946-  1949-  1969-  2049-  2052-  2060-
                         2131-  2141-  2148-  2166-  2169-
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LSPR    001214            36#    348-   385-   432-   465-
MES1    006730           217    1342#
MES2    006752           147    1346#
MES3    007002           149     177    189    198   1351#  2123
MES4    007052           175    1359#
MES5    007150           187    1371#
MES6    007166           196    1375#
MES7    007206          1379#   2121
MORE    005062           968     973#
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MOREVT  003766           709     713#
MSGA    006672          1326#   1333
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MSGTAB    014354          1325    2221#
NOMSGS    014006          2125#   2162    2173
NOP     = 000240            78#
OCTDEC    005612           952    1072    1097#
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OPPRT1    014052          2129    2135#
OPPRT2    014060          2134    2136#   2147
OPPRT3    014072          2137    2139#   2140
OPPRT4    014102          2138    2141#
OPPRT5    014132          2146    2148#
OPPRT6    014174          2126    2166#
PCNT      001254            12*     59#   134*    2178*
PSW       001204            32#    307*   364*    367*    368     372*    373     377*    378     386*    418*    439*    445*
                           466*    471*  1258*
RDY0      001766           252     253     255#
RDY1      002002           257     262#
RDY2      002030           271     276#
RDY3      002044           277     282#
RDY4      002076           286     291#
REICNT    001260            61#   1240    1254
REIT      006504          1288#   1301
RELF      004514           887     891#
RETCHK    003164           528     532#
RETURN    006376           143*    231*    252*    304*    343*    428*    455*    507*    542*    586*    667*    724*    779*
                           869*    985*   1002*   1019*   1038*   1252*   1256#   1259    1629*   1694*   1809*   1888*   1919*
                          2005*   2035*   2093*
RING      001276            72#   2179
RLOAD     005520          1066#   1071
ROTOR     013004          1919    1920    1927#
ROTOR5    013150          1945    1949#   1960
ROTOR6    013222          1955    1963#
ROTOR7    013244          1953    1969#
ROTOR8    013306          1983    1987#
ROTOR9    013400          2005    2006    2013#
ROTR3A    013126          1944#   1966    2000    2028
ROTR8A    013330          1989    1993#
RPEAT     004576           906#    996    1013    1030
RPEAT1    011636          1675    1679#
RSTART    001634            13     142     205     215#    2188
RTTYP     004756           928     943#
R0      =%000000            84#    233*    235*   1202*   1205*   1212    1237*   1268    2182*   2184
R1      =%000001            85#    222*    223*    224     896*    900*    943*    944     946     990*   1007*   1024*   1043*
                          1045*   1046    1048   1059*   1068    1070    1132    1134    1287*   1291*   1304    1308    1325*
                          1326    1634*   1636*   1699*   1701*   1819*   1821*   1901*   1903*   1932*   1934*   2015*   2017*
                          2041*   2045*
R2      =%000002            86#   1097*   1106*   1110*   1288*   1289*   1290*   1291
R3      =%000003            87#    952*   1072*   1104*   1323*   1324*   1325
R4      =%000004            88#    139*    161*    181*    284*    293*    365*    370*    375*    380*    398*    477*   1056*
                          1058*   1098*   1100    1175*   1194*   1196*   1280*   1320*
R5      =%000005            89#   1279*   1321
R6      =%000006            90#    135*    215*    239     406     417     489     498    1202    1203*   1232    1246*   1249
                          1252    1257    1258    1278
R7      =%000007            91#    233     235     897*    901*    991*   1008*   1029*   1044*   1101*   1115*   1156*   1635*
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                    1637*  1700*  1702*  1820*  1822*  1902*  1904*  1933*  1935*  2016*  2018*  2042*  2046*
                    2184*
SAVEPC   001272       69#  1278*  1279   1288   1294*  1296*  1298*  1299
SAVESP   001244       54#  1706*  1741   1776   1777*  1936*  1993*  1995   2024*
SCOPE  = 104400       81#   155    165    170    185    194    203    214    254    261    265    275    281
                     290    306    314    321    329    345    357    363    366    371    376    383    430
                     438    448    460    474    509    526    531    544    550    554    567    571    588
                     597    601    615    619    649    658    669    677    683    701    707    726    734
                     740    758    764    781    790    796    808    814    838    844    871    879    885
                     942    960    966    987   1004   1021   1040   1079   1085   1144   1150   1631   1667
                    1673   1696   1728   1734   1756   1766   1792   1798   1811   1856   1862   1890   1921
                    1975   1981   2007   2037   2067   2073   2095   2154   2160
SCOPEB   006400    1239   1242   1247   1257#
SCOPEC   006254      20   1228#
SCOPEF   006322    1229   1231   1234   1241#
SCOPEG   006356    1243   1252#
SC0      001764     243    254#
SC00     002136     295    297    306#
SC1      002264     332    334    345#
SC10     005126     974    987#
SC11     005210     976   1004#
SC12     005272     978   1021#
SC13     005354     979   1029   1040#
SC14     011424    1089   1631#
SC15     011670    1680   1696#
SC16     012344    1800   1811#
SC17     012664    1847   1890#
SC18     013002    1844   1921#
SC19     013376    1992   2007#
SC2      002566     390    419    430#
SC20     013522    1991   2037#
SC21     013766    2081   2095#
SC3      003100     479    481    509#
SC4      003204     535    544#
SC5      003356     579    588#
SC6      003622     660    669#
SC7      004012     716    726#
SC8      004202     773    781#
SC9      004442     846    871#
SECLF    006104    1165   1175#
SEL1     001410     153    156#
SEL2     001474     168    171#
SEL3     001552     183    186#
SEL4     001576     192    195#
SEL5     001622     201    204#
SLEWT    006040    1058   1163#  1171
STOVER   004660     915    919#
SUBTEN   005650    1101   1105#
SUBTNA   005654    1106#  1109
SUBTNB   005670    1107   1110#
SWR    = 177570      82#   141    220    222   1241   1271   1281   2125   2127   2136   2139   2141   2166
TABLE    014270     224   2190#
TAG1     005750    1132#  1137
TAG2     005770    1133   1138#
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TAG4    006032          1152    1156#
TENPWR  005724          1100*   1106    1110    1120#
TEST    001252            58#    902*    973     975     977     992*    1009*   1026*
TIMER   001230            48#    926*    950     951*    1063    1065*   1163*
TIMER2  012644          1849    1884#
TIME2   012174          1751    1758#
TIMING  004676           913     924#
TIM132  004704           925#    931     934
TITL1   007274           896    1394#
TITL10  010064          1467#   1903
TITL11  010154          1478#   2017
TITL2   007356           943    1059    1404#
TITL3   007402          1045    1409#
TITL4   007444          1416#   1636
TITL5   007510          1423#   1701
TITL6   007620          1436#   1821
TITL7   007706          1446#   1934
TITL8   007770          1456#   2045
TPB     001206            33#   1206*   1209*   1215*   1219*   1304*   1311*   1314*   1317*   1330*   2179*
TPS     001210            34#   1207    1210    1216    1220    1274    1306    1312    1315    1318    1331    2180
TSTTAG  005734           897     901     991    1008    1025    1044    1129#   1635    1637    1700    1702    1820    1822
                        1902    1904    1933    1935    2016    2018    2042    2046
TST0    001346           143     144#   2192
TST1    001700           221     231#    240    2193
TST10   003174           542#   2200
TST11   003346           586#   2201
TST12   003612           667#   2202
TST13   004002           724#   2203
TST14   004172           779#   2204
TST15   004432           869#   2205
TST16   005116           985#   2206
TST17   005200          1002#   2207
TST2    001754           252#   2194
TST20   005262          1019#   2208
TST21   005344          1038#   2209
TST22   011414          1629#   2210
TST23   011660          1694#   2211
TST24   012334          1809#   2212
TST25   012654          1888#   2213
TST26   012772          1919#   2214
TST27   013366          2005#   2215
TST3    002126           304#   2195
TST30   013512          2035#   2216
TST31   013756          2093#   2217
TST4    002254           343#   2196
TST5    002556           428#   2197
TST6    002670           455#   2198
TST7    003070           507#   2199
TTYLD   006556          1300    1304#   1310
TTYMSG  006646          1309    1321#
TYP     006144            15    1202#
TYPA    006204          1212#   1222
TYPB    006236          1214    1219#
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UCASE  013524  2035  2036  2038#
UCASE4  013602  2049#  2059
UCASE5  013616  2052#  2090
UCASE6  013654  2057  2060#
UCASE7  013716  2075  2079#
UCASE8  013726  2080  2084#
VERTAB  003624  667  668  670#
VTAB1  003632  671#  715
VTAB2  003674  685  689#
VTCHK  003664  679  684#
WAITON  006106  139  161  181  284  293  477  1187#
WAREA  001232  49#  950*  1063*  1097  1705*  1908  1909  1718*  1826*  1827  1872  1878  1986*
               1907*  1910  1941*  1942  1996  2020*  2021*  2022  2043*  2048  2084*  2089
WEDGE  011672  1694  1695  1697#
WEDGE1  011750  1708#  1774
WEDGE2  011766  1711#  1717
WEDGE3  012016  1716  1718#
WEDGE4  012100  1736  1740#
WEDGE5  012114  1743#  1749  1778
WEDGE6  012144  1748  1750#
WEDGE7  012226  1768  1772#
WEDGE8  012236  1773  1775#
WEDG6A  012160  1753#  1759
WOFLAG  006034  1056  1162#  1168
WORK  001234  50#  156*  157*  171*  172*  387*  388*  394*  395*  442*  443*  461*  462*
              468*  469*  670*  713*  714  927*  970*  971  983*  984  911*  912  993*
              994  1010*  1011  1027*  1028  1187*  1188*  1189  1639*  1645  1647*  1682*  1703*
              1704*  1705  1706  1708*  1714*  1915  1941*  1746*  1747  1776*  1827*  1835*  1836
              1872*  1878*  1910*  1942*  1952  1956*  1965*  1996*  2022*  2048*  2055*  2056  2089*
              2130*  2135*  2144*  2145
X  = 000021  2189#  2192  2193#  2194#  2195#  2196#  2197#  2198#  2199#  2200#  2201#  2202#  2203#
             2204#  2205#  2206#  2207#  2208#  2209#  2210#  2211#  2212#  2213#  2214#  2215#  2216#
             2217#  2218#  2220#  2223  2224#  2225#  2226#  2227#  2228#  2229#  2230#  2231#  2232#
             2233#  2234#  2235#  2236#  2237#  2238#  2239#  2240#
XERSIZ  005606  1087  1089#
,  = 014416  9#  11#  14#  17#  24#  158  173  237  310  317  325  389  396
           444  463  470  517  520  558  561  608  635  638  642  691  694
           748  751  822  825  828  831  898  910  940  988  1005  1022  1041
           1050  1054  1062  1067  1114  1131  1136  1208  1211  1217  1221  1272  1275
           1282  1307  1313  1316  1319  1332  1350#  1374#  1378#  1388#  1403#  1408#  1415#
           1435#  1445#  1455#  1477#  1489#  1498#  1502#  1534#  1557#  1562#  1586#  1621#  1632
           1650  1697  1913  1721  1745  1785  1817  1833  1898  1899  1929  1930  1940
           1951  2013  2039  2051  2054  2133  2143  2168  2172  2181
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MESSNO	123#	2223	2224	2225	2226	2227	2228	2229	2230	2231	2232	2233	2234	2235	2236
	2237	2238	2239												
TESTNO	108#	2192	2193	2194	2195	2196	2197	2198	2199	2200	2201	2202	2203	2204	2205
	2206	2207	2208	2209	2210	2211	2212	2213	2214	2215	2216	2217			
TYPTST	97#	899	989	1006	1023	1042	1633	1698	1818	1900	1931	2014	2040		
UPDATE	113#	2193	2194	2195	2196	2197	2198	2199	2200	2201	2202	2203	2204	2205	2206
	2207	2208	2209	2210	2211	2212	2213	2214	2215	2216	2217	2218	2224	2225	2226
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ADD      218   1110  1111  1203  1290  1997
ASL      223   1324
ASR     1907   2021
BCS     1107
BEQ      142    221   271   277   317   332   892   913   915   931   945   974   976   978  1047
        1069   1133  1168  1190  1229  1272  1282  1300  1309  1646  1652  1710  1716  1748  1751
        1837   1849  1869  1953  1955  2057  2129  2137  2146  2183
BHI     1234
BIC      315    397   446   472   488   497  1289
BIS      308    323   393   440   467
BIT      141    220   270   276   309   316   324   331  1241  1271  1281  2125  2127
BLT      369    374   379   905   995  1012  1029
BMI      153    168   192   205   263   286   295   359   458   535   575   579   624   629   660
         685    709   742   766   798   816   846   887   928   934   968  1087  1152  1165  1171
        1192   1675  1736  1768  1773  1800  1830  1842  1864  1945  1983  1989  2075  2162
BNE      158    173   310   325   389   396   444   463   470   715   772  1103  1214  1231  1239
        1242   1328  2126  2140
BPL      163    183   201   257   350   434   479   517   520   523   528   547   552   558   561
         564    569   591   599   608   611   617   635   638   642   645   651   673   679   691
         694    697   703   730   736   748   751   754   760   784   792   804   810   822   825
         828    831   834   840   875   881   910   936   948   956   962  1050  1054  1062  1067
        1075   1081  1114  1131  1136  1140  1146  1173  1208  1211  1217  1221  1275  1307  1313
        1316   1319  1332  1641  1650  1663  1669  1680  1713  1721  1724  1730  1745  1754  1762
        1785   1788  1794  1833  1844  1852  1858  1898  1929  1948  1951  1971  1977  1991  2051
        2054   2063  2069  2080  2133  2143  2150  2156  2168  2172  2181
BR       237    240   243   253   297   305   322   334   344   407   419   429   449   481   490
         499    508   536   543   555   572   576   580   587   602   620   625   630   661   668
         686    710   716   725   743   767   773   780   799   817   847   870   888   893   898
         918    921   949   969   986   988  1003  1005  1020  1022  1039  1041  1051  1071  1088
        1109   1137  1153  1193  1222  1243  1301  1310  1329  1333  1630  1632  1643  1654  1656
        1676   1683  1695  1697  1717  1737  1749  1757  1759  1769  1774  1778  1801  1810  1817
        1838   1847  1865  1870  1873  1879  1885  1889  1899  1911  1920  1930  1960  1966  1984
        1992   2000  2006  2013  2028  2036  2039  2059  2076  2081  2090  2094  2134  2138  2147
        2163   2173
CLC     1293   1295  1297
CLR       12    134   138   144   145   160   180   219   234   242   292   466   476   902   925
         951   1064  1065  1105  1162  1253  1825  1876  1908  1937  2026  2038
CMP      239    406   417   489   498   904   930   973   975   977   994  1011  1028  1167  1232
        1299   1308  1651  1709  1848  1952  1954
CMPB     368    373   378  1213  1327  2136  2139
DEC      157    172   388   395   443   462   469   713   770   891   911  1102  1235  1647  1704
        1714   1718  1746  1777  1835  1956  1965  1993  2087
EMT       80
HALT       9    150   178   190   199  1283  2124
INC      236    916   917   926   929  1108  1163  1166  1188  1681  1775  1839  1871  1877  1905
        1957   1959  1987  2019  2058  2144  2178
IOT       79
JMP       10     13   224   390   979   996  1013  1030  1089  1259  2096  2188
JSR      139    161   181   284   293   365   370   375   380   477   897   901   952   991  1008
        1025   1044  1056  1058  1072  1101  1280  1635  1637  1700  1702  1820  1822  1902  1904
        1933   1935  2016  2018  2042  2046  2184
MOV      135    143   156   171   215   231   232   233   235   241   252   283   304   307   343
         347    348   364   367   372   377   384   385   386   387   394   418   428   431   432
         439    442   445   455   461   464   465   468   471   507   542   586   667   670   724
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        727   779   869   872   896   900   903   906   907   919   920   943   950   985   990
        992   993  1002  1007  1009  1010  1019  1024  1026  1027  1038  1043  1045  1059  1063
       1098  1099  1100  1187  1202  1205  1215  1237  1240  1246  1247  1249  1252  1254  1258
       1267  1268  1278  1279  1287  1317  1321  1325  1629  1634  1636  1638  1639  1682  1694
       1699  1701  1703  1705  1706  1708  1740  1741  1776  1809  1819  1821  1823  1824  1826
       1827  1828  1872  1878  1888  1901  1903  1906  1909  1910  1919  1932  1934  1936  1938
       1939  1940  1941  1942  1943  1963  1964  1995  1996  1998  2005  2015  2017  2020  2022
       2023  2024  2025  2027  2035  2041  2043  2045  2047  2048  2084  2088  2089  2093  2130
       2135  2182
MOVB    136   151   159   166   179   222   282   291   456   475   515   518   521   545   556
        559   562   589   605   609   633   636   639   643   671   689   692   695   728   746
        749   752   782   802   820   823   826   829   832   873   908   924   946   954  1048
       1052  1055  1057  1060  1070  1073  1097  1112  1129  1134  1138  1206  1209  1212  1219
       1288  1291  1304  1311  1314  1323  1326  1330  1642  1644  1648  1653  1655  1661  1711
       1719  1722  1743  1752  1758  1783  1786  1831  1834  1850  1884  1896  1927  1946  1949
       1969  2049  2052  2060  2131  2141  2148  2166  2169  2179
NOP    2185  2186  2187
RESET   140   255   330   346
ROR    1294  1296  1298
RTI    1218  1255  1273  1284
RTS     398  1104  1115  1156  1175  1194  1196  1320
SUB    1106  1322  2055
TRAP     81
TST     152   162   167   182   191   200   256   349   433   457   478   527   551   568   598
        616   650   678   702   714   735   759   771   791   809   839   880   912   914   935
        961  1080  1145  1172  1189  1228  1230  1238  1248  1257  1640  1645  1668  1679  1715
       1729  1747  1750  1761  1772  1793  1829  1836  1841  1843  1857  1868  1944  1976  1988
       1990  2056  2068  2079  2145  2155
TSTB    204   262   285   294   358   516   519   522   532   546   557   560   563   574   578
        590   607   610   623   628   634   637   641   644   659   672   684   690   693   696
        708   729   741   747   750   753   765   783   797   803   815   821   824   827   830
        833   845   874   886   909   927   933   944   947   955   967  1046  1049  1053  1061
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